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LECTURES
ON
COMPARATIVE ANATOMY
AND
ANIMAL PHYSIOLOGY,

DELIVERED BY

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LECTURE XXXVII.

ON THE NERVOUS SYSTEM OF THE ENTOMOID AND MOLLUSCOUS CLASSES.

As all developments and metamorphoses in organized beings are from below upwards in the scale, from simple to compound, and as the helminthoid classes are the larvæ of the entomoid, we find in the higher entomoid articulata only a more developed condition of the plan of structure that exists in the nervous and other systems which the worms exhibit. It is well known that the eyes of the mature annelides, like those of the embryo insect, present only a dark opaque pigment covering the optic nerve, which absorbs the luminous rays to produce an impression of light, where there are no transparent parts to form an image of outward objects. The nervous system of the most elevated insects and crustacea begins with the simplest helminthoid form, as the nervous system of man begins with that of the lowest fishes. The larva, like the annelide, is almost a simple cylinder, soft, flexible, smooth, and equal throughout, and the nerves manifest the same equal development from one extremity of the body to the other.

The *myriapods* present the most helminthoid form of all the entomoid classes, and this simplicity of outward form is accompanied by a corresponding inferiority in the type of the internal organs. Their nervous system is that of the worm and the larva, but as their segments develop stronger members to bear them above the ground, their abdominal ganglia are increased in size, to afford additional nerves to those extremities. On looking through these dissected nerves of the *scolopendra* you will perceive the cineritious dark matter of the ganglia in which the sensitive nerves terminate, and the coagulated matter of the whiter columns which intervene between the ganglia. The toughness of the neurilema which envelops the nerves is seen by the stiffness with which the minutest filaments project laterally to a distance from all the ganglia, in the preparations before you. The same property you perceive in the neurilema of insects, but I have always found it softer in the crustacea, where the means of coagulation employed were the same. As all parts of the trunk are equally developed in the myriapods, and the members are equal from the anterior to the posterior extremity of the body, the ganglia are equidistant and equally developed throughout the whole length of the columns. The visceral or sympathetic nerves and their ganglia are less developed than in insects and crustacea, and the nerves of motion come off from the columns more close to the ganglia than in those classes. You will observe by these magnified views of the nerves of motion and sensation in the larva of the *cossus*, given by LYONET seventy years ago, that the nerves of motion come off there at a great distance behind each ganglion. In these dissected specimens, however, of the nervous system of the crustacea, and in these views of their nerves given by AUDOUIN and EDWARDS, you perceive that they come off at a shorter distance behind the ganglia, and the distance is still less in the myriapods and arachnida, where both kinds of nerves come off nearly on the same level, as in the vertebrata. In those annelides where the segments are most short and numerous for

progressive motion, there is sometimes but one ganglion for every three or four segments as in the leech, but in the myriapods the segments are more complete and independent of each other, by each having its brain and both kinds of nerves, and the whole are less intimately united, by the imperfect development of the sympathetic system, which forms a closer bond of union between all the segments of the body, by its more perfect development, in higher articulated classes.

You will observe by these large plates of LYONET, which have never been approached since his time for their minuteness of detail and accuracy of representation, that there are thirteen ganglia, corresponding with the thirteen segments, in the caterpillar of the *cossus*, as in most *insects*. Those ganglia, excepting the supra-œsophageal, which are larger, are nearly equally developed throughout their whole trunk. They are disposed in pairs and are connected together by two columns of nerves, which are beautifully figured in the magnified views before you, of LYONET, copied by GOLDFUSS. We observe the two anterior ganglia—the largest, the supra-œsophageal or cerebral ganglia; they are contained along with the second pair in the first segment or the head. Behind those cerebral ganglia we observe at a short distance the second ganglion, which is the first below the alimentary canal, and consists of two lateral ganglia united together. The nervous filaments, therefore, which connect the first pair of ganglia with the second, form a passage through which the œsophagus extends into the stomach. All the succeeding pairs of ganglia are pretty equally developed, excepting the last, which, like the cerebral ganglia, are larger than the others. The œsophageal ring between the two first pairs of ganglia, is larger during the voracious larva state of insects than in their succeeding conditions. The third pair of ganglia, placed in the prothorax, is generally smaller than the fourth, and the fifth placed, in the metathorax, is generally smaller than the sixth, as you observe in the larva of the *cossus*. The rest of the abdominal ganglia are nearly alike to the last pair, which are closely approximated at an early period to the second last, and are at length united to them.

Between each pair of ganglia, you observe the nerves of motion, in this caterpillar, carefully figured by LYONET, as coming off, and diverging from, the motor columns, at a great distance behind each double ganglion. These motor nerves come off from the upper or central surface of the columns, so that by inverting the animal, they are placed in the same relative situation as in the spino-cerebral axis of the human body and the other vertebrata. Some imagine that these intermediate nerves come off from the ganglia themselves, but you perceive by the plates of TREVIRANUS and MULLER, that a nervous tract exists along the whole of this column in the scorpions, quite distinct from the ganglionic nerves, and the same structure appears to me to exist in all the articulated classes. The first circumstances which appear to give rise to a modification in the magnitude of those ganglia, and in the distance between them, is the development of the extremities for progressive motion from the sides, and an approximation of the segments of the body. In the magnified views before you, of the plates of HEROLD, which I have copied, you will find representations of the nervous system of the *papilio brassicæ* in the caterpillar, in the pupa state, and in the perfect insect. They represent the changes in the nervous system which take place during the metamorphoses of that insect. We have here a view of the thirteen pairs of ganglia, counting the cerebral as the first pair; and you will observe that there is a great equality in the first condition of the insect in these ganglia, and in the nerves which arise from them throughout the whole body. They are connected together chiefly by the two longitudinal cords which constitute the lower and principal part of the nervous columns. They are also connected together by nervous filaments, which pass over the upper surface of this ganglia, without going through them, and which go to be distributed for the motions of the muscles. We perceive that this continuous band along the upper surface of the columns has sent out nervous filaments in the intervening spaces between the ganglia. At an early period, the thirteenth and the twelfth pairs of ganglia are closely approximated to each other, and they are the first to unite together. These, however, in the earlier condition of the insect, are at a greater distance from each other, and the earlier they are examined, at a greater distance are they found from each other. Those are the two ganglia which first leave their original segment, and exhibit that concentration which is observed from behind forwards, or in a longitudinal direction. As the insect, however, passes through its metamorphoses, the abdominal series of ganglia, and the whole nervous system, are contracted longitudinally, and a zigzag appearance is thus produced by the contraction in the nervous columns between the ganglia, as is here represented in the pupa state in the magnified views of HEROLD,

This bent position and zigzag course of these nervous columns is changed in the perfect insect, by their shortening, between the ganglia, to a perfectly straight direction. You will observe, also, that as the *papilio brassicæ* is approaching towards the pupa and the perfect state, certain pairs of ganglia are approaching to one another in a longitudinal direction; that the sixth is approaching to the fifth, that the fourth is approaching to the third, and that those pairs unite in the perfect insect so closely together as to constitute one great ganglia, and that the fourth and the third pairs unite, so as to form another great ganglion. The second pair, or first sub-œsophageal, is also closely approximated to the first or cerebral pair, as the insect advances to maturity. In the earliest period, the most voracious condition of the insect, there is a great distance between the first and second pairs of ganglia, and a large space is left for the œsophagus to pass through. This ring becomes contracted, and in the perfect state the cerebral ganglia are very much increased in size, the organs of the senses have now all become much more developed, and all the organs of the head are increased, the palpi, the antennæ, the eyes, the maxillæ.

We have here also illustrated by HEROLD, in this butterfly, the circumstance, much more common in coleopterous insects, that the nervous matter which originally constituted some of the ganglia in the earliest state of the insect, has been conveyed forward into the more anterior ganglia of the nervous system, and is thus employed to enlarge the other more important ganglia of the thorax, and that two of the ganglia have here entirely disappeared, which generally remain in lepidopterous and hymenopterous insects. Those ganglia have not advanced by the obliteration of the intervening columns, to join the 5th and the 6th, as in other similar ganglia, for you perceive the nerves are still, in the perfect insect, given off from those precise portions of the columns which were occupied by these ganglia in the larva state of this butterfly.

There are numerous other nervous ganglia in insects and other articulata, besides those which are connected with this great nervous column, the analogue of the spino-cerebral axis of the vertebrata. These are seen extending from the cerebral lobes themselves, small nervous filaments, which unite into the first of a longitudinal series of sympathetic ganglia. The first of these sympathetic or visceral ganglia sends out filaments, and farther on in the course of those filaments another ganglion is observed; thus is the system of the great sympathetic so minutely detailed in the plates of LYONET. Those filaments of the sympathetic ganglia are observed to be distributed upon the principal viscera of organic or vegetative life, and it is by the development and extent of this ganglionic system of the viscera, so minutely described by LYONET, DUVOUR, STRAUS, and many others, that the vital connexion of all the segments is chiefly established. You will also observe here represented, distinct ganglia on all the great cerebral nerves going to the principal organs of the senses. There is one on each of the nerves going to the antennæ, the same on the nerves of the mandibles and the palpi, and there are four large accessory ganglia of the brain, behind its lobes, as you perceive in these magnified views of the nervous system of the *melolontha vulgaris*, given by STRAUS. These numerous ganglia, connected with the organic functions, occupy a middle position in the body, below the level of the cerebral lobes, and above that of the the abdominal ganglia. These ganglia throughout the body of insects, though varying in magnitude, have nearly the same structure wherever they occur; they have generally an appearance of cortical or cineritious substance, in which the sensitive nerves appear to terminate, and in the larger ganglia on the columns, this exterior cortical part is seen to enclose, on each side, a small round portion of white soft matter. The development is marked first by an approximation of the columns and their ganglia, transversely, to the median plain, and then, by an approximation, a grouping and a coalescing of the ganglia, in a longitudinal direction. This longitudinal concentration proceeds to a very variable degree in this class, some insects retaining in their mature state the lengthened form of the body, and the detached lineal arrangement of all the separate pairs of abdominal ganglia, as in the annelides and the larvæ; while other insects, as this *pentatoma* and this *melolontha*, have the nervous matter of all the original pairs of ganglia concentrated and accumulated in two points of the body, in the head, around the œsophagus, and in the centre of the thorax, from which the legs radiate, as we observe it developed in the most elevated of crustacea and in the higher classes of mollusca.

The nervous system of the *arachnida* presents an intermediate condition of development betwixt that lengthened and equal distribution met with in the long-bodied insects, and that highly concentrated condition which it presents in the short and broad-bodied brachyourous decapods among the crustacea. The separation of the superior or motor column, from

the two inferior or sensitive columns, is more obvious here than in any other articulata, and was first carefully traced and figured in this class. You observe them figured in these plates of Treviranus and Muller, and in the dissected scorpions before you. Indeed the motor column is here so loosely connected with the two ganglionic columns below, excepting at the ganglia themselves, that my learned friend Dr. Muller was at first inclined to differ from Treviranus as to the true nature of this upper column, which, however, he has faithfully represented as touching all the abdominal ganglia in its course. It is more loosely connected with the two sensitive columns below in the region of the abdomen, than in the long narrow muscular tail, where it is more flat and more spread over the upper surface of the two ganglionic columns, as it is in the crustacea and the other articulated classes. The two kinds of nerves come off here together at the ganglia, as in the myriapods, and not at a distance between the pairs, as in most insects and crustacea, where, however, this distance of the origin of the motor nerves from that of the sensitive I have found to differ greatly not only in different species of the same class, but in different parts of the body in the same animal. In the posterior part of the trunk, the motor nerves come off at a distance, great in insects and short in crustacea, behind each pair of ganglia. But as we advance through the trunk, they begin to approximate their origins till they both arise from the same points of the columns. The nerves of the back part of the chord in the scorpion diverge at right angles in numerous minute fasciculi; but as we advance to the trunk, we find the whole nerves coming off in one large fasciculus on each side of each double ganglion, and these large single nerves directed backwards at an acute angle. The ganglia of the trunk have formed, you perceive, in the scorpion one large nervous mass, from which all the nerves of the legs and the surrounding parts take their rise, as from a single ganglion. This is the kind of concentration we see in the thorax of many of the coleopterous insects and in the higher crustacea.

The supra-œsophageal ganglion is here comparatively small, on account of the small number of organs of the senses, and the smallness of the cephalic appendices, which have to receive nerves from that supra-œsophageal ganglion. But the large articulated organs for progressive motion are developed from the sides of a highly developed thoracic region. On this account we find that the accumulated ganglia are of great size, which are placed together, so as best to supply their nerves below the alimentary canal, at the anterior and lower part of the trunk. By far the largest ganglionic mass of the body is placed in that situation. It is composed of several ganglia united together on each side, forming here a large mass of nervous substance, from which numerous large nervous trunks radiate laterally to the muscular parts of the trunk and the extremities, the viscera being supplied from the ordinary sympathetic ganglia above, as in insects.

In the diversified forms of *crustaceous* animals, we meet with every condition of the nervous system, from that of the larva or the annelide to that of the most elevated of the coleopterous insects. And it has been observed, that the most concentrated form of the nervous system met with in the highest crustacea, in the brachyourous decapods, gradually acquires that concentration of its ganglia by passing through all the inferior conditions which present themselves as permanent or adult forms in this class. Many of the lower crustacea, especially among the amphipoda and isopoda, have the segments which encompass the body equally developed from the anterior to the posterior extremity of the trunk, and this equal development is seen also in the nerves and ganglia of these segments. In the common sand-hopper, *talitrus locusta*, which we see in myriads consuming the ejectamenta of the sea on all our coasts in the summer, the nervous system presents the lowest adult condition met with in this class. The longitudinal columns and the minute ganglia along their course, remain separated from each other by a small space on the median line, and the ganglia remain equally developed in all the segments, and the pairs are equally distant from each other in a longitudinal direction. This is the condition of the nervous system which the highest crustacea present only in their embryo state in the ovum, and which in them is only a transient form. There is no reason for the concentration of these ganglia, or their enlargement in any particular part of the body in this long narrow leaping animal. In the short and broad trunk of the *cymothoa*, the nervous columns have already approached to touch each other, and the ganglia on the two sides have coalesced to form a single chain on the median plane, nearly equally developed throughout their course. This transverse concentration, which is seen in the lower forms of crustacea, is succeeded in higher species by a longitudinal concentration, directed, as in insects and arachnida, chiefly to two

points, the head and the thorax, from which the most important appendices of the segments are developed. In the long-tailed decapods, as the lobster and the cray-fish, you observe the ganglia have coalesced transversely along the whole of the columns, but in the region of the thorax, from which the legs are developed, you perceive these ganglia have enlarged, and have approximated also in a longitudinal direction. In the lowest forms we saw that there was yet no longitudinal concentration either towards the anterior or the posterior part of the body; indeed those parts are even smaller than the middle. But now that the organs of motion have become greatly developed on the anterior part of the trunk, we observe a corresponding increase in that part of the nervous system. The segments on the anterior and on the posterior part of the trunk of crustacea, first approach and coalesce longitudinally, and it is thus that we see the first enlargement of the cephalic and of the caudal ganglia, from their compound nature. This is especially obvious at the head, where the numerous lateral appendices show that it is composed of many anchylosed segments in crustacea as in insects. The caudal ganglion in the lobster you observe of great size, drawn up from the last to the penultimate segment, and united into one with the ganglion of that second last segment. Those post-abdominal ganglia placed before this large caudal ganglion remain permanently small and equally developed in the lobster, and in the narrow and large-tailed decapods. But the five ganglia that are contained within the five segments of the thorax, require a greater size, in consequence of the development of the large articulated organs of motion from those five thoracic segments, and they are enclosed in osseous rings, distinct from those which envelop the other viscera of the trunk. There are always between the supra-œsophageal, and the infra-œsophageal ganglia, two long nervous cords in this class, passing on each side of the œsophagus, so that the œsophagus here passes through a very long nervous ring, as I have represented in the figures of their nervous system before you. Where there are numerous and large appendices of the head to be supplied with nerves, such as these two pairs of long-jointed antennæ (and those are sometimes subdivided longitudinally in the crustacea, where there are organs of hearing developed as in the higher crustacea), where there are large compound organs of vision, numerous jaws, and muscular apparatus of the head, the supra-œsophageal ganglia, or the aggregate cephalic ganglia, must be proportionally large, and we find this to be the case.

But the highest condition, the most concentrated form, of the nervous system met with in the crustacea, or in all the articulated classes of animals, is that which is found in the brachyourous or short-tailed decapods; and in none of that group, perhaps, is the concentration more marked, and to a greater degree, than in this spider-crab, *maia squinado*, where all the sub-œsophageal or abdominal, and the thoracic ganglia, coalesce into one great nervous accumulation in the centre of their short and rounded body. It is quite clear from observing the short globular form of this *maia*, that there was no necessity for lengthening out this great nervous centre to supply those extremities, because of their so radiating from around a central point in the middle of the trunk. Accumulating all those sub-œsophageal ganglia close to each other into one large round nervous mass, the separate nerves could more conveniently be sent out to those diverging muscular extremities, and much better than if all the ganglia here collected into one had been kept as usual at a distance from each other in a lengthened series. The cephalic or supra-œsophageal ganglion in these brachyourous decapods is comparatively small, from the smallness of the parts developed from the head. Between these two ganglia, the cephalic and the thoracic, extend the two great cords which embrace the œsophagus, and the columns continue slender and without ganglia, giving off nerves along the median plane to the anus. The ganglia on the visceral nerves, and on those of the senses, are seen in this as in the other crustaceous animals, and in all the entomoid articulata.

The nerves of motion coming from the upper column are very large in the lobster and other macrourous decapods, especially in their post-abdomen, from the great muscularity of that part of their body. These come off in that region, you perceive, at a shorter distance behind the ganglia than in most insects, but in the region of the thorax it is obviously more convenient for them to come off at the same points as the sensitive nerves, to arrive together at the extremities. In this posterior part, you observe two principal trunks coming off from each side of these double ganglia. One of these trunks immediately passes below and the other above the large longitudinal muscles, in the same manner as you see in the two corresponding nervous trunks of the larva of the cossus, so accurately figured by Lyonet. The ganglia, in this region of the body, are comparatively

small, but in the large caudal ganglion you perceive easily the two central lobes of soft white matter, from the cortical part, surrounding which the sensitive nerves come off, as is still more distinctly seen in the scolopendræ, among the myriapods, where all the ganglia of the columns are large and united. The same is easily seen in the large thoracic ganglia of the lobster or the cray-fish. The motor nerves come off in large tufts, directed upwards and in contact, and by pulling them asunder in the thoracic region, we remove the two divisions of the motor column from large ganglia beneath, and expose the white lobes of these brains of the segments.

On looking into this skeleton of the cray-fish, you observe that there is a solid entothoracic canal to protect these great nervous columns, and to separate them from the general cavity above, containing the other viscera. These are vertebral foramina, for the columns of the spinal marrow, but placed, you observe, below the bodies of the vertebræ, and where the motor column is actually above the sensitive in the ordinary position of the animal's body. When you examine, however, the relative position of all the other systems of these articulated animals, you will perceive that there is a reason for this apparently inverted position of the motor column of nervous filaments. The articulated classes of animals are turned upon their backs, that this all-important nervous system, in their delicate and comparatively unprotected though highly organized bodies, may be in the best position for protection—running thus along the under or abdominal region, while the organs of the senses are directed upwards. It is thus that we see that their digestive apparatus, in place of running along the under or fore part of the great nervous columns, as it does in vertebrata, runs, in the natural position in which we see these animals moving, along the upper or dorsal aspect of their spino-cerebral axis. Their respiratory organs also are here placed in an inverted position, for we see them in the crustacea extending from the haunches upwards towards the back, and not hanging forwards as usual from that part of the trunk. We see the heart, the great centre of the circulation, in these articulated animals, in place of occupying the anterior or inferior part of the body (in front both of the nervous and of the digestive system of organs, as in vertebrata), placed along the middle of the back. We were at first surprised to hear from Herold and Rathke that the umbilicus entered by the back, and not by the front part of the body, in the arachnida and crustacea. This is the proper place, however, for it to enter, as in vertebrata. How could it here reach its proper place if it entered in front, or by the under surface, where the nervous columns and the muscles are placed? It enters directly from behind into the intestine, which here runs along in the middle of the back near the surface. So it is then with those nervous columns for sensation and motion, which are also obviously placed in the same inverted position as the other organs of the trunk, and all are placed in the proper relative positions which they occupy in the vertebrata, by simply inverting the body of these animals, and opening the mouth below. Although the nervous ring and the body of the vertebræ are thus already developed, the inferior vascular ring is not developed till the body is turned upwards to its proper position in fishes.

Thus the most elevated form of the nervous system met with in this great articulated division of the animal kingdom, begins its career of development with two simple abdominal filaments, like the lowest helminthoid form of the entozoa, and, by a gradual process of concentration, longitudinally and transversely, from the periphery to the central parts, it arrives at the condition of the cyclo-gangliated classes, with its great ganglia confined to the œsophageal ring.

The soft condition of the nervous matter, and of its enveloping neurilema, which we see in these large aquatic articulata the crustaceous animals, we find still more marked throughout the molluscous classes, which are composed almost entirely of aquatic animals. The nervous system is distinctly developed, and provided with several ganglia, in all the molluscous classes, from the lowest of the compound *tunicatæ* to the highest of the *cephalopods*; and notwithstanding the great diversity of form which the animals of this division present, and the less perfect acquaintance obtained with the distribution of the nervous system in their various forms, from the difficulty which its softness presents to its minute investigation, we can perceive a certain similarity of character and unity of plan in the development of this system in the cyclo-gangliated classes. It exhibits in these classes, as in the short round bodies of the cyclo-neura, a tendency to develop and accumulate around the anterior extremity of the alimentary canal. In the tunicated and conchiferous animals its great centres present a sub-œsophageal character; in the gasteropods and the pteropods they are more equally distributed around the entrance to the

digestive canal, and in the more elevated forms of cephalopods they mount to a supra-œsophageal position. We have seen that the tendency of development in the articulated classes is to produce this concentration of the nervous system around the œsophagus, and the nearest approach to the cyclo-gangliated character is seen in the highest crustacea, in the short round bodies of the brachyourous decapods.

In the aggregated *tunicata*, as in the *botryllus* and the *pyrosoma*, there is a small round ganglion within the muscular tunic of each of the component animals, placed near the entrance of the respiratory orifice, and between that opening and the anal. When we compare the position of these apertures with those of the conchifera, we perceive that this ganglion is situate on the ventral part of the body and is sub-œsophageal, though at some distance from the entrance to the digestive cavity. This ganglion generally sends small filaments around the respiratory orifice, and also backwards to the anal aperture of the sac. You observe the same ganglion figured by SAVIGNY in these compound animals, the *polyclinum*, the *aplidium*, the *didemnum*, the *eucœlium*, the *synoicum*, the *diazona*, the *distoma*, and in all the higher forms of simple *ascidiæ*. The filaments from this ganglion, after surrounding the respiratory orifice of the sac, sometimes unite above that opening to form a separate ganglion, from which nervous filaments extend along the back. These ganglia appear to be more connected with the muscular apparatus of the respiratory sac and its orifices, like the third or posterior pair of ganglia in the conchifera, than with the deep-seated vital organs. The minuteness and softness of all the parts in the separate animals of these compound tunicata, prevent the tracing of the nervous filaments in them connected with the organic functions, but in the simple or detached forms of ascidiæ, which acquire a greater size, as the *cynthia* and *phallusia*, these visceral or sympathetic ganglia are more obvious. Three ganglia are there observed in the abdominal cavity, extended between the stomach and the respiratory sac, and sending nerves to the surrounding parts. These, which were first described by MECKEL, may be considered as occupying a sub-abdominal situation, like the three corresponding pairs of the conchifera. These tunicated animals generally possess exquisite sensibility in the margins and tentacula of the respiratory orifices, which are ciliated, like the gills for the respiratory currents, as in the conchifera.

At the bottom of the respiratory sac in the *conchiferous* animals, we perceive, on throwing aside the gills and the lateral prolongations of the lips, two ganglia placed on the lower and lateral parts of the mouth, which send up nervous filaments to encompass the œsophagus and supply the anterior parts of the trunk. Two double nervous columns extend from these ganglia backwards to the base of the foot, running parallel and near to each other, and almost in the median line of the body. These two sub-abdominal columns of motor and sensitive nerves, arrived at the back part of the liver, and at the broad base of the foot, meet another pair of symmetrical ganglia of great size, and which send out numerous nerves to the muscles of the foot and to the neighbouring organs. The two symmetrical double columns continue backwards parallel to each other, and in the middle of the abdominal surface of the trunk, to the back part of the ovary or the inferior surface of the great adductor muscle of the valves. In that place they meet with two smaller ganglia, from which large nerves pass into the muscle itself, and the two parallel columns continue backwards to the anus. In the common muscle these two posterior terminations of the sub-abdominal columns, after encompassing the rectum, pass on to the fringed and ciliated posterior openings of the mantle, on which they are extensively distributed, both on the anal and respiratory orifices. These two sub-abdominal columns, and the pairs of ganglia symmetrically disposed along their course, vary in their relative development, and in the magnitude of the cords they give out, according to the various forms of these inhabitants of bivalve shells, and the magnitude of the parts they have to supply. Other ganglia on particular nerves are also seen in different parts of the body, but generally smaller than those of the sub-abdominal columns of motor and sensitive nerves, which are the most constant in this class, and are analogous to those pointed out by MECKEL in the sac of the tunicata. In the magnificent work of POLI on these bivalved animals, and in the wax models of these parts executed under his direction for the museum of Paris, you will find these nerves described by him as lacteal vessels, and the ganglia as lacteal reservoirs, a mistake into which he was led by their milk-white colour and softness, and the facility of injecting them. The anterior sub-œsophageal pair of ganglia send up lateral filaments to surround the mouth and supply the long tentacular striated lips, and sometimes this oral nervous ring is closed above the œsophagus, and develops a supra-œsophageal ganglion, where they

meet, thus approaching to the character of the gasteropods.

The nervous system of the gasteropods presents a much higher development in the region of the œsophagus or the head, and a much greater concentration in that place than the conchifera. We sometimes find all the ganglia of that part of the body accumulated into one great supra-œsophageal ganglion, as you observe in this common sea-snail, *doris argus*. Again, in some, as in the *aplysia*, there are three nervous ganglia, forming, by the nerves which join them, a continuous nervous circle around the œsophagus, and anterior to these is a large sub-œsophageal ganglion, below the muscular part of the mouth, so that a double nervous ring is here formed. Those nervous filaments in the *aplysia*, passing upwards from the supra-œsophageal ganglion go chiefly to the tentacula, and parts about the mouth; those from two lateral ganglia go to the sides and back of the trunk. But we observe also in the aplysia two long nervous filaments passing, one from each of the two lateral nervous ganglia of the œsophagus downwards and to the right side of the body, where they meet upon the aorta,—upon the principal trunk coming from the heart; and that at the point of junction of these descending chords, there is a large sympathetic or visceral ganglion, which sends out nerves to the neighbouring organs of the abdomen.

In the *haliotis*, or sea-ear, we see no true supra-œsophageal ganglion, but two small lateral ganglia joined by a minute nervous band passing over the œsophagus; and from these lateral ganglia pass, downwards and backwards, four nervous chords, to join a larger posterior and inferior ganglion placed on the median plane of the body. From this inferior median ganglion pass backwards a series of parallel nervous chords to the posterior part of the body; but there is no repetition of ganglion along these inferior longitudinal nervous chords, as in the articulata. The nervous system is similar to this in the common limpet or *patella* in every part. In the common *buccinum undatum* there is but one large infra-œsophageal ganglion, which radiates nervous filaments to all the surrounding parts. In the *janthina* there are two pairs of œsophageal ganglia; in the *limnea*, the œsophageal ganglia are so approximated as to form a continuous collar round that part; in the *onchidium* they form a broad band by their union above the œsophagus, and they are similarly united on the œsophagus in this little floating *scyllæa pelagica*.

In the *pteropoda*, the great nervous centres present the same general characters of position on the entrance to the œsophagus, and variety of outward form in the different species, as we have seen in the gasteropods. They form a chain of four detached œsophageal ganglia in the little *clio borealis*. In the *pneumodermon* they form a very narrow ganglionic band above the œsophagus, and a group of six minute ganglia below it; and in the *hyalæa* they form a single supra-œsophageal ganglion, as in the doris among the naked gasteropods.

In the class of cephalopods, the highest of this division and of all the invertebrated animals, these œsophageal ganglia are already approximated in form, position, and texture, to the brain of fishes, and are enclosed in an organized cranial cavity. They form a continuous double ganglionic band around the œsophagus in the *nautilus*, where they are imperfectly surrounded with the cranial cartilage, as in many of the gasteropods, and the posterior or cerebral portion is still very small, and extended transversely. In the naked and more elevated forms, this posterior or supra-œsophageal portion has acquired the concentrated and lobed form of a brain, sending out large nerves to the organs of sense, and extending backwards, along the median plane, two large chords of motor and ganglionic nerves, situate above the abdominal viscera, like the spino-cerebral axis of the vertebrata; but these longitudinal dorsal nervous columns of the naked cephalopods are not yet enclosed in a cartilaginous tube, which constitutes the first and simplest condition of the skeleton in the vertebrata. The optic ganglion, so small in the nautilus, acquires an enormous development in the naked species, and the organs of hearing are already provided with solid calcareous bodies, and enclosed in the cranial cavity, as in fishes. Visceral or sympathetic ganglia are also seen in the cavity of the abdomen, supplying with nervous filaments the digestive organs, and especially the stomach and liver. Thus all the great systems of nerves of the vertebrata are already developed in the cephalopods, and the great nervous centres are here extended longitudinally above the alimentary canal and the circulating system, as they continue upwards, to man.

Frogs.—Until the year 1696 frogs were unknown in Ireland. At that period frog spawn was taken from England by one of the Fellows of Trinity College, Dublin, and distributed in the ditches of the University pleasure-grounds, from which time these jumpers spread themselves from field to field throughout the whole island. Adders have yet no existence in Ireland.

AN ESSAY ON

THE ATOMIC THEORY.

By JOHN S. HILEY, *Esq., Surgeon, Elland.*

PART III.

I NOW come to notice the second proposition, viz., that the proportions in which one element combines with a second is generally the same in its union with a third. This is one of the most important laws in the Daltonian system, and from its almost constant unchangeableness, it not only assists the memory in retaining the proportional numbers, but strengthens, and in a manner confirms, the views which Dalton held upon this sublime theory. Now if the proportion of oxygen was different in its union with carbon, and the same with all other elements, to what it is when combining with hydrogen, what an effort of the memory would be requisite to remember the different numbers! From the variety of compounds which exist, it would probably take up a man's life to get up all the equivalents, whilst the opinions which Dalton entertained regarding atoms would be totally without foundation. But in place of such confusion, nature has ordained that in all her works there should be measure, number, and weight, and that the law of definite proportions should extend uniformly over the infinite productions of the globe. From this we at once observe the vast information which may be gained by a glance at the table of chemical equivalents. Thus,

Hydrogen being	1
Carbon	6
Oxygen	8
Phosphorus	12
Azote	14
Sulphur	16
Calcium	20
Sodium	24
Iron.....	28
Copper	32
Chlorine.....	36
Potassium	40, &c.,

we not only see the exact proportions in which hydrogen unites with most of the elements below it on the scale, but we also learn the quantities in which those elements combine one with another. Nothing can be more beautiful than this law; nor is it confined to the above elements, but prevails throughout the whole logometric scale. A few examples will display its importance in a stronger light, thus:—

Hydruret of carbon consists of	hydrogen	1 + 6 carbon.
Water	hydrogen	1 + 8 oxygen.
Oxide of nitrogen	oxygen	8 + 14 nitrogen
Oxide of carbon.....	oxygen	8 + 6 carbon.
Oxide of chlorine	oxygen	8 + 36 chlorine.
Muriatic acid.....	hydrogen	1 + 36 chlorine.
Sulphuretted hydrogen	hydrogen	1 + 16 sulphur.
Oxide of potassium	oxygen	8 + 40 potassium.
Sulphuret of potassium	sulphur	16 + 40 potassium.
Chloride of potassium	chlorine.....	36 + 40 potassium.
Protoxide of iron	oxygen	8 + 28 iron.
Oxide of calcium (lime)	oxygen	8 + 20 calcium.

Here it will be necessary to observe, that the equivalent proportions of these compound bodies, as is the case with all others, are obtained by adding together the numbers representing their elements. Thus the equivalent of water is 9, being formed by the combination of hydrogen 1+8 oxygen;—oxide of carbon is 14, being composed of oxygen 8+6 carbon; muriatic acid 37, the numbers of its elements being hydrogen 1+36 chlorine;—and the same with the rest. It must be remembered also, that in all the above instances, I have adopted hydrogen. The reason, as I have before stated, is this. If hydrogen be represented by 1, it was discovered by the celebrated Dr. W. Prout that the numbers of most of the other elements may be noted by integers. Such being the case, their compounds may be marked by integers also, whereas by adopting the standards of Thomson, Wollaston, or Berzelius, we are obliged to receive their fractional parts as well, many of which, more particularly those of the latter, reach the third decimal place. Nothing can be more puzzling, or require a greater effort of the memory; and would the reader himself prefer examining into the truth of this allegation, he need only glance over Berzelius' Table of Definite Proportions, attached to Dr. Daubeny's recently published work on the atomic theory. He will there see what has more than once been styled the simplest of all discoveries, mystified and obscured to his entire satisfaction.

I now come to the third and last propositi-

tion, viz., that when a body combines with another in more than one proportion, the quantity of one element is generally double, triple, or some other multiple of its lowest number. The nature of this law will be readily understood. Along with the second, it has done more towards promulgating Dalton's notions respecting atoms than anything that was ever before advanced. It at once allows of the possible indivisibility of atoms, and presupposes that if such were not the case, the fact would hardly exist that all elements are in double, triple, or some other multiple of their lowest number, when combining with others in more than one proportion. For to admit the existence of a demi-atom is an absurdity. One or two chemical compounds, however, supply apparent exceptions to this law, but in all probability these are more apparent than real. They shall be noticed in their proper place. In most cases where several combinations of two bodies occur, their component particles combine in the proportion of 1 to 1,—1 to 2,—1 to 3, &c. A few instances will render this more evident. Thus, there are two combinations of oxygen and hydrogen. In the first, the ratio of the hydrogen to the oxygen is as 1 to 1; in the second as 1 to 2. For example,

Protoxide of hydrogen, or water, is composed of	hydrogen	1+ 8 oxygen.
Deutoxide of hydrogen	hydrogen	1+16 oxygen.

Oxide of selenium is composed of	oxygen	8+40 selenium.
Selenious acid	oxygen	16+40 selenium.
Selenic acid	oxygen	24+40 selenium.

Nitrous oxide	oxygen	8+14 nitrogen.
Nitric oxide	oxygen	16+14 nitrogen.
Hyponitrous acid	oxygen	24+14 nitrogen.
Nitrous acid	oxygen	32+14 nitrogen.
Nitric acid	oxygen	40+14 nitrogen.

In illustration of this canon, many more examples might be adduced. I have said, however, that there are a few exceptions to it, and these are in the instances of ammonia,—manganese,—lead,—and iron. The combinations of hydrogen and oxygen; and of oxygen and nitrogen being in accordance with the above law, one would expect that hydrogen and nitrogen would also unite in the same manner. But in place of this, the formation of ammonia is an exception, both to the second and the third proposition, for though the equivalent of hydrogen in its union with other elements, is 1, and that of nitrogen 14, yet they do not, even in the only known combination existing between these two gases, preserve such uniformity, since instead of the ingredients being 14 by weight of nitrogen and 1 of hydrogen, the quantity of the latter element is 3. Chemists have also proved, by experiments, that the oxygen uniting with the above metals to form different states of oxidation, is not in the quantities coinciding with this important law. In order to elucidate their notions, it will be necessary to state that

Protoxide of manganese is composed of	oxygen	8+ 28 manganese.
Deutoxide	oxygen	12+ 28 manganese.
Tritoxide	oxygen	16+ 28 manganese.

Protoxide of lead	oxygen	8+104 lead.
Deutoxide	oxygen	12+104 lead.
Peroxide	oxygen	16+104 lead.

Protoxide of iron	oxygen	8+ 28 iron.
Peroxide	oxygen	12+ 28 iron.

In the first of these instances it will be seen, that the ratio of the oxygen is as 1 : 1½ : 2,—whilst in the last it is as 1 to 1½, or as 2 to 3. Now, if we consider the atom indivisible, this mode of reasoning is absurd, for we cannot say half an atom. But were we to take double the proportions of each ingredient, this anomaly would at once be corrected. Nor do I see why this should not be the case, as it seems to me to be much more likely that two equivalents of one ingredient may unite with two,—three,—or four proportions of another, than that combination should take place as above. Besides that, it is not unlikely that, ultimately, other compounds of these substances may be discovered, inasmuch as the combinations of oxygen and sulphur to form sulphurous and sulphuric acids, were subject to this irregularity,

until the discovery of the hyposulphurous acid. So circumstanced, there are great encouragements held out for entertaining such an idea, for were an oxide of lead to be discovered, consisting of 104 parts of the metal to 4 parts of oxygen, not only would our hopes be realized, but the oxides of lead would then accord with the usual laws of chemical combination. According to Berzelius, the oxygen in the arsenious and arsenic acids is as 3 to 5. It is not improbable that this anomaly, if such exist, may be cleared up also.

In this place I will introduce some remarks, which Mr. Dalton, with honour to himself, enrolled with his ideas of the atomic theory. I have already advanced some evidence in favour of such a notion, but it will be necessary to make some further observations. In commenting upon the three great propositions which the Daltonian system has enabled chemists to establish, I have endeaved to show that when combination takes place between two elements, it is in the ratio of 1 to 1,—1 to 2,—1 to 3,—&c.; and that a body when combining with a second, generally unites in exactly the same proportion when mixing with a third. It has also been shown that there are few exceptions to this rule, and that these are, perhaps, more apparent than real. Such being the case, and Mr. Dalton being perfectly acquainted with the unchangeableness of these laws, it is not a matter of much surprise to me, and more especially since the notion had occupied the attention of men of science for so many ages, that the beautiful idea occurred to the mind of the British philosopher, "that those proportional numbers represented the respective weights of the atoms of the combining bodies."

This notion was much strengthened by the fact, that when one body combines with another in more than one proportion, the quantity of one of the elements is generally double, triple, or some other multiple of its lowest combining number. It was never found to be half or a quarter, or any other subdivision of the whole number, but, as might be supposed from the indivisibility of atoms, an atom of one element was always joined to one, two, or three atoms of another. This important discovery at once rendered the ancient atomic hypothesis more apparent than ever, and served to satisfy the minds of many, of the truth and justice of its tenets.

Another fact, equally remarkable, and which did much towards promulgating Dalton's ideas was this. It must occur to every one, that whenever union takes place, that must be the strongest and most inseparable which is atom to atom. No union can possibly be more energetic, because in this each atom is bound to the other by the whole force which it possesses. Hence this was called a binary combination. Where a single atom of one element is united to two atoms of another, the two atoms will be held with but half the force. This was called a ternary compound; and when one atom is united to three, the last are kept in union with only one-third the force. This was called a quaternary combination. In all other combinations of one atom with more than the above, the affinity of the larger number for the single atom decreases in the ratio. Now this asseveration is not founded on theory, for the third equivalent of oxygen in the peroxide of maganese is easily driven off, the second is expelled with greater difficulty, whilst the first dose requires both considerable heat and labour before a separation can be effected.

Now, from the difference which has been found to prevail in the weights of the definite proportions of all elements, it is not unlikely that such a variation will exist betwixt their particles or atoms, and if the existence of such a fact be admitted, no one will presume to affirm that in the various combining numbers we are not possessed of the relative weights of their atoms. Add to this the harmony and regularity which reign throughout all the numbers, and their compounds will at once convince the most sceptical, that such may not altogether be attributed to chance, but that the laws of this sublime theory were founded by, and came from the hands of, the great despotic Ruler of the universe, who, in the words of the Psalmist, "weighed the mountains in scales and the hills in a balance."

The next point to be alluded to is, that of the theory of volumes. This discovery was first made known to the scientific world by the deservedly celebrated Gay Lussac, the French chemist. In point of ingenuity and industry he is not excelled by either Thomson, Wollaston, or Berzelius. In advocating the fact, that bodies unite in definite proportions, he discovered from experiment, that the same law existed in the combination of gases by volume. This discovery induced many, and amongst them Berzelius, to adopt the theory of volume in preference to that of atoms, because of the former admitting of subdivision; and certainly such an idea is worthy our attention, because it entirely does away with all hypothesis, if such really were known to exist. Were any one disposed to reject the atomic theory, I think he might be deterred by being informed of the great connexion that is present betwixt the weight of bodies in a

gaseous state and their equivalent numbers. This important disclosure completely overthrew all the opinions which Berthollet had laboured to establish in opposition to the atomic theory. He was the only Frenchman of talent who resisted the advance of the corpuscular system, and who continued to believe in the indefinite union of bodies, but in spite of this opposition, and the influence which it was likely to have in prohibiting the other French chemists from adopting the more prevalent notion, the discovery of Gay Lussac served at once to confirm and establish Dalton's views, by exhibiting them in a completely different form. In a word, the ideas which Berthollet had hitherto supported with considerable talent, were entirely borne down, and the doctrines of the British philosopher, through the ingenuity of Gay Lussac, established on their ruins.

The density of gases varies like that of any other bodies, and, consequently, different weights of matter often occupy the same space. Gay Lussac found that gases unite together in such proportions that a volume of one always bears a simple relation to a volume of the other. Thus, like atoms, it might be 1 to 1,—1 to 2,—1 to 3,—or some other multiple of the lowest measure. He proved the prevalence of this law from a great number of experiments upon the gases; and he also found that it likewise extended to the airs. Now he noticed that one volume of hydrogen combined with half a volume of oxygen to form water, and that the latter, in the same proportion, half a volume, united with one measure of chlorine, forming muriatic acid. One measure of nitrogen and three of hydrogen form ammonia,—and one volume of carbonic acid, and one volume of ammonia form carbonate of ammonia. Such are a few instances of the leading doctrine of Gay Lussac; but it does not rest here, for he showed, with considerable sagacity, that mixtures of gaseous substances and solids were regulated by the same law. Thus, let us suppose an atom of carbon weighing 6 grains, and two atoms of oxygen weighing 16 grains, uniting to form carbonic acid, which is the case; then 100 cubic inches of oxygen will unite with 12.7 grains of carbon, because the quantity of the former weighs 33.888; consequently, as

16 : 6 : : 33.888 : 12.7.

Now the carbon, in the last proportion, is found, when in vapour, to occupy precisely 100 cubic inches. Hence the quantity of the two bodies corresponds, both in the relative weight of their volumes, and in that of their atoms, inasmuch as the atomic weight of carbon bears the same relation to the atomic weight of oxygen necessary to form carbonic acid, as the volume of carbon bears to the volume of oxygen requisite for attaining the same end. The following table shows how nearly the laws of the theory of volumes agree with the doctrine of definite proportions.

	Volume.	Atomic Weight.
Oxygen	▭	8
Hydrogen	□	1
Carbon	□	6
Chlorine.....	□	36

The first column represents the combining proportions of these gases by volume, and the second their equivalents by weight. The comparative weights of the different volumes in the first column are indicated by the numbers in the second:—thus half a volume of oxygen unites with one of hydrogen to form water,—and with one of carbon to form carbonic oxide,—whilst hydrogen combines with an equal volume of chlorine to form muriatic acid. In these few examples, the connexion that exists between Gay Lussac's Theory of Volumes and Dalton's Doctrines of Chemical Equivalents, is satisfactorily exhibited, and it may not be superfluous to add that the same connexion extends to all other bodies. Dr. Boswell Reid has affixed a table opposite the title-page of his admirable Elements of Practical Chemistry, stating the composition of many important combinations, both by weight and by volume.

Another remarkable circumstance consequent upon the union of volumes is a condensation of the mixed gases, in accordance with certain laws. Thus the contraction is generally to one-half,—one-third,—one-fourth, or some other quantity bearing a strong relation to the space which the gases occupied before mixture. In illustration of this point, I may refer the reader to the formation of ammonia,—sulphuretted hydrogen,—sulphurous acid,—carbonic oxide,—and carbonic acid. In ammonia the four volumes contract to two; in the sulphuretted hydrogen there is a condensation of two volumes to one; in sulphurous acid a contraction to a third of the previous bulk of the gases; in carbonic oxide three volumes condense to one or one-third; and in carbonic acid there is a condensation to one-half.

Dr. Prout published an essay in the *Annals of Philosophy*, "On the Relation between the Specific Gravities of Bodies in their Gaseous State, and the Weights of their Atoms." In this invaluable paper he has shown, that as the volumes of the four elements bear the same relation to their atoms, the same law may extend

to the vapours of other bodies. Thus half a volume of oxygen corresponding to an atom of that element, a whole volume of the vapours of other substances may have the like relation to their atoms. These are, sulphur, iodine, carbon, &c. An example will best explain Dr. Prout's method. Half the sp. gr. of oxygen, which is 0.5555, is multiplied by the atomic weight of the gaseous body under consideration; the product is then divided by the atomic weight of oxygen, and the quotient will be the specific gravity of the other principle. Thus the sp. gr. of the vapour of sulphur may be obtained; for as

8 : 16 :: 0,5555 : 1.1111.

Now 8 is the atom of oxygen, 16 that of sulphur, and 1.1111 the sp. gr. of the vapour of sulphur. By reversing this process, the atomic weight of sulphur may be deduced; for as

0. 5555 : 1.1111 :: 8 : 16,

and 16 is the equivalent number of sulphur. This law reaches to the vapours of other bodies.

After Thomson, Berzelius has, perhaps, laboured most to develop the different laws by which the atomic theory is governed. He was induced to engage in this important inquiry from a perusal of the works of Richter; and that his researches were carried on with a degree of talent and ingenuity seldom witnessed in any philosopher, his different papers, and his treatise on "The Theory of Definite Proportions," sufficiently evince. Many of the canons, however, which his numerous analytical processes enabled him to adduce, resemble too nearly those of the British philosopher to render it necessary for me to recount them. I may, however, just observe, that he assumed, with Dalton, the existence of indivisible atoms, and that "one atom of one element unites with 1, 2, 3, or more atoms of another element." The second great law of the indefatigable professor of Stockholm is, that "two atoms of one element combine with three or five of another," as is instanced in the oxygen of the arsenious and arsenic acids. But the third and greatest canon of Berzelius is, "that two compounds which contain the same electro-negative body, always combine in such a manner, that the electro-negative element of the one is a multiple by a whole number of the same element of the other." Thus the oxygen in the carbonic acid, which unites with potash to form carbonate of potass, is a multiple of the same element contained in the latter, as,—carbonic acid, 22, contains of oxygen 16; potassa, 48, contains of oxygen 8. Many more examples might be adduced. Now the element, as oxygen, which is common to both the electro-positive and the electro-negative component parts of a compound body, is generally in one of the elements a multiple by 2, 3, or 4, of that which is contained in the other. In all the neutral sulphates this multiple is 3, as in the case of the sulphate of potass:—Sulphuric acid, 40, contains of oxygen 24; potassa, 48, contains of oxygen 8.

Sulphuric acid is the electro-negative element, and potassa the electro-positive one, and it will be seen, as was advanced, that the oxygen in the former is to that in the latter as 3 to 1. "Double salts are also influenced by the same law. In the tartrate of potash and soda, for example, the oxygen of the potash is exactly equal to the oxygen of the soda; and the oxygen in the tartaric acid, which neutralizes the potash, is equal to that of the soda." According to Berzelius, however, the nitrates, phosphates, and arseniates, are exceptions to this principle.

In addition to this the professor of Stockholm believes, that in every salt of each class, the oxygen of the acid bears a similar relation to that in its base. Thus, in the neutral sulphates, as has been shown, it is 3 to 1, in the carbonates 2 to 1, and in the bicarbonates 4 to 1. These laws, however, seem wholly dependent on those laid down by Dalton; for, as Dr. Thomson has observed, the oxygen in the oxide, in case we admit the indivisibility of atoms, and the existence of the principle as well in 10,000 atoms as in one, must be the same, or some multiple of the oxygen contained in the base. Certainly, there are some exceptions to this law, as in the persulphate of iron when united with phosphoric acid, but still I cannot help thinking, that this deviation is more apparent than real, or that there is some fact, as yet concealed from us, which future investigations will bring to light. A new oxide of iron may be discovered.

Berzelius believes, that the doctrine of definite proportions is not confined to chemical combinations alone, but extends to the substances of even the animal and vegetable kingdoms, and it is singular that in the excellent sermon on Praise and Thanksgiving by Bishop Atterbury, that celebrated divine has the following passage. "When God had finished this goodly frame of things, which we call 'the world,' and put together the several parts of it according to his infinite wisdom, in exact number, weight, and measure, there was still wanting a creature in these lower regions that could apprehend the beauty, order, and exquisite contrivance of it." Whether Bishop Atter-

bury had an eye to these words, " Παντα μετρῳ, καιαριθμῳ, και σταθμῳ διεταξας," taken from the Book of Wisdom, a work supposed to have been written by Philo the Jew, I cannot pretend to say. It is not, however, improbable, though, of a truth, we occasionally hear the sublimest sentiments proceeding from men of genius and talent on different subjects, without their having had a knowledge of any thing that had been previously written. And this is more especially the case when the subject under consideration is such as to appear, to the learned at least, to be present in all the works of nature, though not as certainly proved. Besides that, it often happens that an individual of abilities stumbles unexpectedly upon the self-same notions which have occupied, or are now occupying, the attention of men of genius. The philosophers of France have, ere now, been engaged in discoveries which at the same season were occupying the men of science in Britain.

Since the supposition of Berzelius was promulgated respecting the theory of definite proportions pervading the animal and vegetable kingdoms, as well as that of the mineral world, it has been carried still further. There have not been wanting men who would fain extend the law to the Linnean system of botany, and to the members of the planetary system. They have argued, that such is the relation of number between the division of the calyx and corolla, and the stamens and pistils of plants; that such is the correspondence in point of distance and magnitude between the members of the planetary system, and such the relation betwixt the laws which pervade the minutest conceivable atom, and those that act in the immense aggregates of them; that the tendency to definite proportions, one of the consequences of which is the atomic theory, " is clearly manifest throughout the whole range of nature," so that it may well be said to be the mark of that Deity, of whom it has been observed, " the heavens declare his glory, and the firmament showeth his handy work." Arguments also in favour of the Daltonian system have been advanced by Wollaston, from the extent of the atmospheres of the sun and planets being limited; by Leslie, from the fact that the atmosphere surrounding our earth is confined within certain bounds; and by Faraday, from the evaporation of bodies being stopped at a very low temperature, at which point the gravity of their particles is exactly equivalent to the force of repulsion. Now it must be obvious to every one, that were bodies divisible to any extent, the point just alluded to could never be found, for however low the temperature or force of repulsion, particles would still be supplied minute enough to come within the sphere of their action.

The preceding remarks upon the laws and doctrines of the atomic theory, will hardly be complete unless blended with some observations on isomorphism; as also with the views which Berzelius has taken respecting bodies called by him " isomeric;" and likewise with Dr. Prout's notions concerning merorganization. This singular but interesting doctrine of isomorphism* was first advanced by the celebrated professor Mitscherlich of Berlin, and founded on some important discoveries made by him in 1819. No discovery promises to be of greater service to mineralogy and chemistry. Previous to this, the mathematical researches of the Abbé Hany and others respecting the structure of crystals, produced great improvements in the science of mineralogy. In the language of Daubeny, " Hauy ascertained that every solid body possesses a peculiar geometrical arrangement, from which all the manifold varieties of form it presents can be shown to be derivable."

These different figures, six in number, result from the union of minute crystals, each possessing the shape of their aggregates. The learned professor just quoted, desirous of adducing as much evidence as possible in favour of the existence of atoms, has the following passage respecting this singular fact:—" Now whatever may be the primary cause of these distinctions in crystalline arrangement, their permanency in the same species seems to show, that each must be made up of parts as unchangeable in size and figure, as in the other chemical and physical properties that belong to them." Now the numerous and scientific investigations of the Berlin professor are favourable to the same conclusions. They at once prove the connexion existing between the crystalline form and composition of bodies, and from other results he was induced to assume, that in many instances two substances dissimilar in their constituents, often put on the same crystalline figure. All the instances of this nature, from their containing sometimes one atom, sometimes two, and so on, he necessarily divided into different groups, corresponding with the quantity of oxygen which each class was found to contain.

Every substance, classed in the same group, did not, however, wear the like shape; but he was led to suppose, that if their form was not absolutely identical, it must be nearly so. For he argued, that if

* From ισος, equal, and μορφη, I form.

we admit the possibility of the ultimate particles of some of the metals being similar in figure, we must also allow, that when these metals combine with the same proportion of oxygen, this identity in shape must still remain. Now this supposition is a very reasonable one, applying equally to the negative electrics; and professor Mitscherlich accordingly styled all such compounds "isomorphous substances." When union is accomplished between two bodies, the one is a positive and the other a negative electric, and the oxygen in the one bears a certain relation to that in the other. In the negative electrics are all the acids, and in the positive electrics all the bases. Each of these great classes is divided into groups, in accordance with their proportions of oxygen. Thus of the bodies in a negative state, protoxide of nitrogen, carbonic oxide, and the hyposulphurous acid, from their containing but one atom of oxygen, rank in the first group; the sulphurous, the carbonic, the selenious, the antimonious acids, and nitrous gas, rank in the second, because they have one atom of base and two of oxygen; and the sulphuric, the silicic, and the silenic acids in the third, containing three atoms of oxygen to one of base. In the hyponitrous, arsenious, oxalic, and phosphorous acids, there are two of base to three of oxygen; whilst in the nitric, arsenic, antimonic, and phosphoric acids, the proportions are three of base to five of oxygen. Among bodies in a positive state of electricity, the same law prevails. Thus, in the first group, containing one proportional of oxygen, there are, potass, soda, lithia, barytes, strontites, lime, magnesia, and the protoxides of the metals; in the second group, containing two atoms of oxygen, are the deutoxide of tin and the peroxide of manganese; and in the third, where there are three atoms of oxygen to two of base, are, zircon, glucine, alumina, the peroxides of sodium, of iron, and of many other metals.

Now the assumption that bodies are sometimes isomorphous, was founded on the belief, that if two acids, each containing equal proportions of oxygen, unite with the same base, the two salts resulting from such combinations must present a similar appearance. Now the Russian chemist has proved this to be the case, and in support of his reasoning, has brought forward many examples. The most interesting of these are the salts of phosphoric and arsenic acids, and to such a degree does the law in question influence these compounds, and so near do the different salts resemble each other in appearance and figure, that it has been found that the various isomorphous acids and bases might be easily substituted for each other, without the shape of the resulting compound being materially altered. Thus the neutral phosphate and biphosphate of soda exhibit precisely the same crystalline form as the arseniate and biarseniate of soda. The biphosphate and biarseniate of potass correspond in the same manner as do the phosphates and arseniates, and the biphosphates and the biarseniates of ammonia and barytes.

Some objections were raised by Professor Marx, of Brunswick, in respect to the arseniate and phosphate of soda bearing a similarity of figure, but the experiments of Mr. Clarke, of Glasgow, have satisfactorily discovered the cause of this anomaly, and have proved that, instead of weakening Mitscherlich's discoveries, it rather serves to strengthen them, for the Glaswegian chemist found, that a difference in the quantity of water existing in the two compounds, a circumstance which had before-time been noticed to give rise to dissimilaritics in substances otherwise isomorphous, was the sole cause of this deviation from the general rule. He was likewise fortunate enough, besides clearing up this difficulty, to discover a new phosphate of soda, resembling in appearance the arseniate, and containing the same proportional of water, viz. 15 atoms. The first phosphate contained 25 atoms, exactly 10 atoms more than the arseniate of soda, and therefore giving rise to a difference sufficiently apparent to induce Professor Marx to dispute the truth of this doctrine. Indeed, whenever two isomorphous salts crystallize with different proportions of water, their forms vary also.

Besides the salts of arsenic and phosphoric acids, there are likewise many other isomorphous substances. The salts of lime, for instance, are isomorphous with those of magnesia, the protoxides of iron, cobalt, nickel, and manganese, oxide of zinc, and the peroxide of copper. Lead, barium, and strontium, in a state of the first oxidation, when combined with the same acid, produce salts which are isomorphous, and, what is somewhat remarkable, when that acid is the sulphuric, they all possess nearly the same degree of insolubility. The carbonates of the same isomorphous bases as those of lime and protoxide of iron, are also identical in form. The salts of sulphuric and silenic acids, when combined with the same base, and analogous proportions of water, are also isomorphous; as are the salts of alumina with those of the peroxide of iron.

There are other coincidences in isomorphous bodies equally singular, as, for instance, their tendency to unite with the

same equivalent proportion of water, and, when that is not the case, the difference in form and appearance, which is necessarily the result. The strongest instances of the former law, are in the salts of arsenic and phosphoric acids, whilst the latter is fully illustrated by the sulphates of manganese and copper, which, though isomorphous with the sulphates of iron and zinc, are, nevertheless, dissimilar in form. This is imputable to their not containing the same quantity of water, for when they coincide in that point, their identity is in every respect apparent. According to Mitscherlich, combinations of sulphate of copper and zinc, of copper and magnesia, of copper and nickel, of zinc and manganese, of magnesia and manganese, take place, which are of the same atomic constitution as the sulphate of iron and sulphate of cobalt, and though they do not contain a trace of either of those salts, yet have the same crystalline form. Sulphate of iron and sulphate of copper crystallize together with great readiness, and providing the proportional of water be the same as in the pure protosulphate of iron, the crystals, though containing considerably more copper than iron, are similar to those of the latter. The proportions of water of crystallization, with which different groups of isomorphous salts are disposed to unite, vary. Some contain 2 atoms, others 4 atoms, a third 6, a fourth 10, a fifth 12, a sixth 14, and so on.

Now, it is supposed that such oxides, acids, and salts, as are isomorphous, must also possess isomorphous bases. Thus phosphorous and arsenious, and phosphoric and arsenic acids, and the salts resulting from their union with isomorphous bases, being isomorphous also, it is contended that the law must likewise operate with the bases of these two acids, phosphorus and arsenic. For the same reason, selenium is believed to be isomorphous with sulphur, and the same identity is thought to be preserved between all the metals and oxides of those metals whose salts are governed by the same principle. Thus sodium, potassium, calcium, iron, and manganese, are suspected to agree in the shape of their ultimate particles, from which it would seem that from isomorphous elements we may look for isomorphous compounds. The electro-negative division are subject to the same remark, for, as far as our present knowledge extends, the justice of this doctrine is pretty visible, inasmuch as the peroxide of iron and alumina are isomorphous, as well as their salts.

The tendency which isomorphous substances have to unite with each other, is another fact worthy of notice. To such a degree does this prevail, that it is often with the greatest difficulty that they can be separated. Hence it happens that, in spite of all that we can do, the phosphates often contain arsenic acid, and the arseniates phosphoric acid. The native isomorphous salts are frequently found to contain other isomorphous acids than their own, and such are their affinities, that almost insurmountable difficulties are encountered in purifying salts of this kind by crystallization. In support of this fact, Beudant observes "that all the species of alum have so strong a tendency to mix together, that it is very difficult to counteract it; neither, when once united, can they be completely separated, even by repeated crystallizations. Mixtures of the same kind occur between nitrate of baryta and nitrate of lead, between the nitrates of potassa and soda, between the sulphates of iron, cobalt, nickel, &c., and between the sulphates of zinc, soda, and magnesia, &c. &c. These mixtures occur, not only when a solution contains merely the salts of the above-mentioned group, but if a great number of salts be dissolved in the same liquid, they will form by preference; so that it may be said, that salts belonging to the same order of composition, seek each other, as it were, so as to crystallize together, and mix in every proportion." Dr. Daubeny has also shown the difficulty of separating magnesian salts from calcareous ones, and the salts of lime and of magnesia are isomorphous.

It is possible that the laws of isomorphism may hereafter supply us with additional means of proving and determining the atomic weights of numerous compound bodies; nor is this the only advantage we may expect to result from this doctrine. It appears almost to clear up the point of contention respecting the divisibility or non-divisibility of matter, for if the atoms of isomorphous substances did not very nearly resemble each other, how is it possible that such should be the case with the aggregates of them?

If we admit the strength of this hypothesis, of course we must admit the possible existence of the atomic theory; and, anyhow, identity, in the shape of elementary particles, is altogether incompatible with the notion that matter is infinitely divisible. These discoveries of the laws of isomorphism have, indeed, contributed much to the establishment and promulgation of the Daltonian system, for they prove the fact of elements and compounds uniting in definite proportions, and the justice of the conclusion that atoms are not only indivisible, but that they must, in a great measure, re-

semble each other in their outward figure and appearance.

From what the doctrine of isomorphism appears to teach, we are led to conclude that all bodies allied to each other in their atomic proportions and in their shape, ought to resemble each other in their external forms. But the contrary is sometimes the case, for, from discoveries which have been made of late, it has come to light that, even among what are identical in composition, there are some which not only differ in appearance, but are possessed of properties which render them quite unsuitable for the class to which they ought to belong.

Dr. Faraday appears to have been the first to draw the attention of philosophers to this circumstance, for in 1825 he pointed out to chemists the existence of two compounds of carbon and hydrogen, in the exact proportions of 6 of the former and 1 of the latter. These substances, however, bore not the least resemblance, for one was a highly volatile liquid, and the other a gaseous body, known commonly under the name of "olefiant gas." Berzelius pointed out, in 1830, several additional substances of this nature, and called them "isomeric."* Amongst the most remarkable were the cyanous, fulminic, phosphoric, and tartaric acids. By a red heat, phosphoric acid, though not altered in its constitution, acquires altogether new properties, throwing down from nitrate of silver a white instead of a yellow precipitate, and coagulating albumen. In tartar, the professor of Stockholm discovered an acid resembling the tartaric in its chemical constitution, but different in its properties.

Dr. Prout has brought forward other instances of the same nature. Thus the sugar from the urine of patients labouring under diabetes, and that obtained from the cane, is not dissimilar, either in property or composition, from the sugar procured from gum-arabic, manna, and milk; yet by the action of nitric acid on the former, oxalic acid is obtained, whilst the latter, when subjected to the same menstruum, yields mucic or saccholactic acid. This anomaly, according to Dr. Prout, is owing to the admixture of some ingredient foreign to animal and vegetable productions. Such bodies he supposed to be merorganized, or in a state of merorganization,† meaning, by this expression, that they were becoming in a slight degree organized. This foreign matter, however, must operate in very minute proportions, as nothing of the kind can be detected in those bodies which resemble each other in their chemical constituents, but differ in their properties and appearance, and, besides that, it must possess considerable power in preventing the molecules of similar substances from assuming their usual form of crystallization. This influence of the foreign matter is in no case better exemplified than in that of starch and sugar, for starch is sugar in a state of merorganization, and though so unlike in their outward appearance, yet in their atomic proportions and chemical constituents they are identical.

The power exerted by foreign matter, sometimes too minute to be detected, has been considered by a few as being next to impossible; but the promulgation of Mr. Herschell's researches, respecting this important subject, has now almost put the matter beyond a doubt. Thus he has discovered, that the least conceivable particle of potassium, or any other substance, in an opposite state of electricity, may give rise to an entire change in the relation which a mass of mercury &c. may have to electricity. These ideas are inserted in the 115th volume of the Philosophical Transactions, from which I subjoin the following remarkable passage:—"That such minute proportions of extraneous matter should be found capable of communicating sensible mechanical motions and properties of a definite character to the body they are mixed with, is perhaps one of the most extraordinary facts that has appeared in chemistry. When we see energies so intense exerted by the ordinary forms of matter, we may reasonably ask, what evidence we have for the imponderability of any of the powerful agents, to which so large a part of the activity of material bodies seems to belong."

Such being the power of potassium, there is nothing improbable in the fact that an infinitesimal particle of any foreign substance present in a species of matter, may change the aspect of the whole; that the medicinal properties of Spa water, which analyses have proved to resemble in their constitution various chemical salts, may still differ materially from those salts in their effects upon the animal economy, and this too in consequence of the presence of the least conceivable portion of some other body, as iodine or bromine; and that, as Dr. Prout has observed, the health of the human frame may eventually suffer from the diffusion of very minute proportions of noxious gas through the atmosphere.

* From ἴσος, equal, and μέρος, partly or part.

† From μέρος, a part, or partly — i. e. partly organized.

As a firm believer in the existence of indivisible atoms, and in the important doctrine of definite proportions, it will be seen that I have laid hold of every argument favourable to those opinions. In doing this, I am greatly indebted to the recently published volume on the atomic theory by Dr. Daubeny, professor of chemistry in the University of Oxford. In improving my notions respecting atoms, that publication has greatly assisted, and it is somewhat singular that it should have fallen into my hands whilst engaged in drawing up the preceding essay.

Arguments in favour of atoms have been adduced from the doctrine of definite proportions, from substances not combining indefinitely, from crystallography, from isomorphism, from the permanency existing in all natural productions, from the limited extent of the atmospheres of the sun, planets, and earth, and from the existence of a limit to evaporation.

The theory of definite proportions has also been supported by a variety of facts which no reasoning can subvert, inasmuch as their truth and exactness have been proved by a mass of experiments, conducted with every possible care. The results of those researches have enabled chemists to adduce arguments in favour of this important law, from the saturation of an acid with an alkali being always at one point, from the fact that when two neutral salts decompose each other, the compounds resulting therefrom are likewise neutral; from the proportion in which one substance combines with another, being always the same in its union with a third; from the fact that where combination takes place in more than one proportion, the quantity of one of the elements is generally double, triple, or some other multiple of its lowest combining number; from Gay Lussac's theory of volumes; from the existence of isomorphous substances; from the regular proportions observed in the floral organs of plants; and from the size, distance of, and circuit described by, the members of the planetary system.

In conclusion, I may remark that such is the evidence in the preceding sheets in favour of the indivisibility of atoms, and the existence of definite proportions, that not a doubt occurs to my mind of the truth of those important laws. I feel convinced that they had their origin in the great Author and beneficent Preserver of nature, and no reflecting mind can meditate for a moment on the harmony and order of the various species of matter which exist on the globe, without partaking in some measure in the hallowed contemplations of the Psalmist, when he exclaimed, "O Jehovah, how manifold are thy works! In wisdom hast thou made them all." Every law which pervades the universe,—from the minutest particles to the immense aggregates of them instanced in the formation of the sun, the planets, and the earth,—powerfully attests the wisdom by which they are directed, and shows that the infinite variety of matter everywhere manifest is merely the result of the definite combinations of a few simple elements one with another, the indivisible atoms of which may be figuratively styled the Alphabet of Nature.

Elland, near Halifax, 1834.

To render this essay more complete, I have thought it advisable to subjoin the following table of the chemical equivalents, atomic weights, or proportional numbers, of the elementary substances:—

CHEMICAL EQUIVALENTS OF ELEMENTARY SUBSTANCES.

Hydrogen 1.

Non-Metallic Substances.

Hydrogen	1	Phosphorus*	16
Carbon	6	Chlorine	36
Oxygen	8	Selenium	40
Boron	8	Bromine*	75
Nitrogen	14	Iodine	124
Sulphur	16	Fluorine	

Metals.

Silicum*	8	Rhodium*	44
Lithium*	10	Molybdenum	48
Aluminum	10	Cerium	50
Magnesium	12	Cadmium	56
Glucinum	18	Palladium*	56
Calcium	20	Tin	58
Sodium	24	Copper*	64
Cobalt	26	Thorinum	68
Nickel	26	Barium*	70
Iron	28	Bismuth	72
Manganese	28	Tungsten*	96
Chromium*	28	Platinum*	96
Iridium*	30	Lead	104
Titanium*	32	Silver	110
Tellurium*	32	Columbium*	144
Ittrium*	34	Mercury*	200
Zinc	34	Gold*	200
Arsenic	38	Uranium*	208
Zirconium*	40	Osmium	
Potassium	40	Vanadium	
Strontium	44	Pluranium	
Antimony*	44		

The above are the atomic weights of the elementary substances, as determined by Professor Thomson. Several of them, however, have been since found to be incorrect, inasmuch as they do not tally with the experiments of other chemists,

and more especially with those of Berzelius. To such of them a * is annexed. The following are the equivalents of the doubtful bodies, according to the latest discoveries of the Stockholm professor :—

Non-Metallic Substances.

Phosphorus. Berz.	15.71
Fluorine	18.86
Bromine. Berz.	78.26

Metals.

Chromium	32
Rhodium. Berz. About	52
Palladium. Berz. About	53
Iridium. Berz.	99
Platinum. Berz. About	99

RECORD

OF THE

CONCOURS HELD AT PARIS,

IN JUNE 1834,

To supply the Vacancy in the Chair of

CLINICAL SURGERY,

OCCASIONED BY THE DEATH OF BARON BOYER.

THE Concours, which was lately commenced, for filling the vacant medical chair in the University of Paris, affords us an opportunity of accomplishing an object which we have long desired to effect, —that of submitting for the perusal of our readers, a concise but complete account of a concours, as it is held before the Faculty of Medicine in Paris. We do not intend at present to enter upon any consideration of the advantages of the concours as a test of merit. Our purpose is rather, by a register of facts, to enable our readers to form a judgment for themselves on the subject. One thing, however, is palpable, namely, that although under this system the most deserving candidate may not always be successful in his competition, yet that intrigue can never effect the introduction of a professor who is decidedly inferior to his competitors, or unfit for the chair to which he aspires. The publicity of the trial has always been found a sufficient guarantee against an error of that kind, which is so frequent where the concours is unknown.

The trials (*epreuves*), according to which the candidates in a French concours are to be judged, are, as we remarked in a former article on this subject, three in number. The first and second consist in the examination of two patients during a quarter of an hour, and the delivery of a clinical lecture for one hour on the cases so examined. Twenty minutes are allowed to each candidate to arrange his ideas and reflect on the case, immediately after he has examined the patient, and before he commences his lecture.

The third trial consists in a thesis on a subject drawn by lot, for the preparation of which the candidate is allowed a certain number of days, after which he again occupies the chair, and has to support his thesis, during an hour, against the argumentations of his adversaries, who attack him in turn. We should observe, that each candidate delivers two clinical lectures of an hour, in which he is accompanied, in his examination of the patients, by his competitors and the judges, who examine the patients after him, and note any omissions which he may have made, &c.

Finally, the anterior titles, as they are called, form a third item in the estimation of the candidate's qualifications. These comprise the services he may have rendered to the profession in general, or to the peculiar part of the science connected with the chair for which he competes; his discoveries and improvements, for example, in surgery, his literary qualifications, the works he has written, &c.

The concours of which we propose to furnish a report to our readers, was opened on the 16th of this month, at the School of Medicine, to fill the chair of clinical surgery vacant by the death of Baron BOYER.

The first step taken, is the formation of a jury composed of twelve individuals, and these are chosen by lot, partly from the twenty-four professors of the School of Medicine, and partly from the Academy of Medicine; eight of the former being joined to four of the latter.

The first meeting was, as usual, merely preparatory. The names of the jury and of the candidates were declared, and the rules of the concours read aloud by the secretary. The jury was declared to be composed thus;—for the Faculty of Medicine,

M. Jules Cloquet, president; M. Paul Dubois, secretary; MM. Dupuytren, Roux, Marjolin, Gerdy, Moreau, and Cruveilhier;—For the Academy of Medicine, MM. Larrey, Amussat, Renault, and Gemelie.

The list of candidates amounted to no less than ten; but one was excluded as not appearing when his name was called over, and a second, because he was ineligible, as not having fulfilled the time prescribed by rule from the period of his graduation. There remained, therefore, eight, viz., MM. Lisfranc, Velpeau, Sanson, Blandin, Berard the younger, Langier, Guerbois, and Lepelletier.

The names of MM. Lisfranc, Velpeau, and Blandin, are sufficiently known to the English reader, and do not require any notice on our part. M. Sanson, though perhaps less known on this side the water, enjoys a well-deserved reputation at Paris, as an excellent practitioner, and the author of several excellent works; he is second surgeon to the Hôtel Dieu, and lectured, last winter, during the absence of Baron Dupuytren, to the great satisfaction of a large class of pupils.

M. Berard, brother to the professor of physiology, is a young man of much merit and promise. M. Lepelletier is a provincial surgeon, who, it is said, has quitted a large practice, and the direction of a fine hospital at Mons, to enter the lists against the *elite* of the profession in the capital. Of M. Guerbois we know nothing, except that he is an old surgeon, and was lately placed in the hospital of La Charité, as successor to Boyer.

On gaining entrance into the amphitheatre of the School of Medicine (says our Paris correspondent), which we did with infinite difficulty, although we took care to present ourselves at least an hour before the commencement of the concours, the eye was struck by the spectacle of an immense semicircular room, containing more than 2500 students and professional men of various ranks, whose interest in the events of the concours has been kept up throughout the whole course of the lectures.

Independently of the importance attached to the election of a surgical professor who is to be charged with the clinical instruction of a large body of students, the present concours is rendered doubly attractive on account of the presence of M. Lisfranc, who now comes forward, we believe for the first time, as a candidate for the favour of a community which he has so often exhibited in colours unfavourable, and by many of which he is mortally hated. M. Lisfranc, in fact, although no one can doubt his high talents and reputation as a surgeon, is looked on by the aristocratic part of the profession in Paris nearly in the same light as the Council of the London College of Surgeons might regard a thorough reformer of medical abuses. About ten years ago, when there existed only two hospitals of clinical instruction in Paris, he received charge of *La Pitié*, instituted a new clinique, and soon raised it from obscurity, to the reputation which it now possesses of being one of the best schools in which a student can commence his hospital studies. The rising reputation of *La Pitié* soon became an object of jealousy to the official proprietors of the *Hôtel Dieu* and *La Charité*, and a war of the most inveterate nature, which has persisted to the present day, commenced between the professors of the school on the one part and M. Lisfranc on the other. His quarrel with M. Dupuytren, if it did not originate in, was at least fomented by, personal considerations, and frequently gives occasion to a burst of vituperative eloquence directed against the Baron in the midst of a clinical lecture, which has the most dramatic effect. Perhaps it was the desire to see in what manner M. Lisfranc would comport himself before a jury composed of his ancient adversaries, that attracted such a multitude of auditors to the present concours; and whether it arose from real affection to the professor of *La Pitié*, or, as others said, to annoy M. Dupuytren, who is by no means a favourite, the air rang with thunders of applause, which were repeated during several minutes whenever M. Lisfranc presented himself in the amphitheatre. We can call nothing to mind of a similar nature, except the shouts which sometimes hail Mr. O'Connell when he presents himself to *the association* after a successful campaign of "agitation."

Velpeau was received with a nearly equal degree of affection, arising not only from his popularity, but probably as a testimony of the sympathy so generally felt for the ill-treatment he received at the last concours.

The jury, as we have before said, was determined on the 16th of June, when the preliminary measures were gone through. On the 17th one of the candidates, chosen by lot, was accompanied by the jury to the *Hôtel Dieu*, at four o'clock, when he examined his two patients, and on returning to the School of Medicine, commenced his lecture about half-past five. This was repeated by each candidate in turn, and composed the first trial.

We now propose to give as complete a view as our limits will permit, of the lectures delivered by the principal candidates, and shall then notice the thesis and argumentations founded on them, summing up the whole by a review of the anterior titles possessed by each. In this manner we hope to give a good idea of an institution, which, though capable of abuse, is yet accompanied by high advantages. We commence with the lecture of M. Sanson.

LECTURE BY M. SANSON.

The two patients who fell to the lot of M. Sanson were placed in No. 19 Salle St. Marthe, and No. 12 Salle St. Jean, *Hôtel Dieu*, and afforded subjects for the following lecture:—

First Patient.—Caries of Lumbar Vertebræ.

Gentlemen,

The first is a child eight years of age, of a lymphatic temperament; his skin is fine and white; the abdomen much developed; the hair light-coloured; in a word, he presents the characteristics of what may be called a scrofulous beauty. The family of this child is, according to all account, healthy, and he himself has enjoyed a good state of health until within eight months of the present time. At that period the patient first experienced some pain in the region of the loins, which remained for some time; I cannot exactly say how long, as the answers of the child were not very precise upon this point; the pains were not accompanied by any feebleness of the lower extremities, or symptoms of any organic affection. After a few months a tumour made its appearance at the upper part of the thigh, and was at first accompanied by pulsations, which have since disappeared. The swelling gradually increased in size, and is now as large as two fists united together, occupying the inner and upper part of the thigh. When examined by the hand, there is an evident feeling of fluctuation, and its volume is influenced by the position in which the patient may be placed. Thus, when the child lies down on his back, the tumour becomes less tense than in the upright posture, and if we press the hand flat on the thigh, the contents are displaced, and ascend into the iliac fossa; hence we may conclude the existence of a large cavity filled with a liquid matter. I should remark that the skin is not adherent to the surface of the tumour, but is moveable on all points of it. The child, as was before remarked, seems to enjoy still a good state of health; he is not affected with diarrhœa or sweating; his appetite is good; sleeps sound; he walks without experiencing inconvenience, and the affection is as yet completely local. The sister of the ward says he has coughed for the last three months; this led me to examine carefully the state of the chest; on auscultation we could not discover any symptom of the presence of tubercles in the lungs; the respiration, on the contrary, was healthy; there was no matity upon percussion at any point of the thorax; the only anormal sound was some mucous râle indicating a chronic catarrh, but this was slight, and the expectoration was not by any means abundant.

What, we ask, is the nature of the disease under which our patient labours? It may be laid down as a general rule, that when you have a tumour presenting itself at the upper part of the thigh, after a continuance of lumbar or dorsal pains, the existence of caries of the vertebral column is very probable. The diagnosis is sometimes, however, accompanied with difficulties; in the present case, indeed, we are assisted by a leading symptom, for we have a slight gibbosity of the lumbar vertebræ, and hence we are justified in concluding that the vertebral column is affected; we should however, in all cases, wait for the formation of an abscess, before we give a decided opinion, because, in many circumstances, as in the case of a fall on the loins, accidental injury, &c., we have often the symptoms of vertebral disease, although no caries exists. But our patient was not affected by any accident of this kind, and the pains commenced without any appreciable cause.

Let us begin by endeavouring to determine the origin of the disease in the present instance. Rachitis is a very frequent

cause of softening of the vertebral column, and this often produces the angular curvature; so much so, that many practitioners regard the angular curvature as a characteristic of rachitis; hence much doubt on the origin of the affection must exist, until caries has actually set in. But we have to remember that rachitis has a set of symptoms by which it is distinguished; it is a general constitutional disease, not a local one; rachitic children are feeble, and mostly sunk in a state of *abattement* and depression of spirits; they exhibit an indifference to what passes about them, while, at the same time, there is a precocity of mental powers, which is very remarkable; the gastric organs are usually affected in this disease; the mesenteric glands are engorged; the child has often diarrhœa, with a slow fever, or an acceleration of the pulse towards evening; he is pale, the lower jaw projects, and he gradually gets thin, and pines away. Now we remark none of these symptoms in our patient; his health has been good, and we have, besides, another proof that his affection does not derive its origin from rickets, because we find the characteristic signs of an abscess by congestion. We have, therefore, in the present case, a formation of pus in the cellular sheath surrounding the lumbar nerves, or psoas muscles, and passing down as far as the thigh, where it presents itself; this matter is of an inflammatory origin. We first had pain in the part for a considerable period, and then the formation of pus, which is now making its way to the exterior along the sheath of the muscles; the disease, in a word, is caries of the vertebral column, with abscess by congestion.

But we do not find here the symptoms which most commonly accompany caries of the spine. In most cases the disease commences by vague pains in some one point of the vertebral column; these become worse, and the patient soon experiences some difficulty or loss in the power of the locomotive system. Thus, if the disease commence in the lumbar region, the curve of the spinal column begins there, and the patient's movements are embarrassed in consequence of the influence which this change of form exercises on the action of the nerves; the general position of the patient is very characteristic of the affection under which he suffers; the head and neck are thrown back, and the legs are bent in such a way as to produce a most uneasy position. If you remark the child when he walks, there is no action of the thighs, he seems to walk merely with the lower leg. When the bodies of several vertebræ are engaged in the disease, the spinal marrow may be pressed on in a moderate manner, and certain symptoms, as subsultus tendinum, convulsive movements of the muscles, indicate this complication; the patient feels a weakness of the lower extremities; if he sit down, or attempt to lift up anything from the ground, he is compelled to bend the limbs gradually, and dip down with a slow motion. The child whom we had to examine did not present any of these accidents; he walked well, as has been remarked, and did not show any impediment of motion.

Whence arises this exception from the accidents usually accompanying caries of the spine? The reason is that he has several of the bodies of the vertebræ affected at the same time; when one only is diseased, the curvature which results is angular, and the pressure exercised on the spinal marrow is, consequently, more sudden and violent, giving rise to convulsion, paralysis, or retraction of the limbs. The compression of the spinal marrow is not the only cause of the disorders which we sometimes witness in the organs of locomotion; inflammation may come in as an accessory cause, extending from the bodies of the affected vertebræ to the membranes, and from the latter to the spinal marrow itself. We have, therefore, in the present case caries of the vertebræ, and abscess by congestion. The caries occupies many vertebræ together, for if we examine the state of the spinal column we find a gradual bend, quite different from the sudden angular curvature when one vertebra only is destroyed; and this circumstance fully explains the little or no difficulty of motion which our patient experiences, his upright posture in walking, and the freedom from all unpleasant or dangerous accidents.

The question now arises, What is the cause of the disease in the present case? The exciting causes of caries of the vertebral column are in general difficult to discover. Our patient's father is a tailor, and his children have been accustomed to spend their time in a low, ill-ventilated shop. This may be the origin of the scrofulous affection under which he now suffers, and although the cause is not very well marked, yet the bad habit of body contracted by living in an unwholesome place, is sufficient to excite the disease.

In what state is the vertebral column?

The affection sometimes commences in the bodies of the vertebræ, and then we have them only inflamed. If it persist for some time, the weight of the body begins to act on the altered and softened bone, breaks it down, and a curvature more or less prominent is the consequence. But in our patient we have not only in-

flammation of the bone, but suppuration also. The disease is not confined to a simple ramollissement; the spongy tissue of the bones has become fungous, purulent matter is secreted by them, and a large cavity exists, filled with that fluid. If we had an opportunity of examining the state of the parts which transmit the pus from the seat of the disease to the exterior, we should find a long channel, hollowed out through the cellular sheath surrounding the muscles: the channel is lined throughout by a membrane which constantly secretes pus, and is called by surgeons purogenerative (*puro-genié*). In its structure it resembles somewhat that of the mucous membranes.

How does the disease terminate? (Here M. Sanson entered into an extensive examination of the different ways in which caries of the spine may end, and of which we need give but a very faint outline.) The affection in the first place may go on and become daily worse; the inflammation extends to the membranes of the spinal marrow, and to the medullary substance itself; we have then the development of a new set of symptoms; motion becomes irregular and interrupted, and paralysis is finally established. The patient is now confined altogether to bed, his health is completely destroyed, the long-continued pressure brings on gangrene of the battock, &c., and death ensues. In many cases, however, the purulent collection opens by a small abscess in the thigh; the opening is often very minute, but this does not prevent the entrance of atmospheric air into the cavity. The patient soon presents severe typhoid symptoms, from the degencrescence of the purulent contents of the abscess; his lungs are attacked, and, on examination, we find tubercles, which perhaps we did not before suspect or discover; diarrhœa now sets in, and he soon sinks in a state of exhaustion. In other more favourable cases the termination is of a different character. The tissues surrounding the diseased and carious vertebræ furnish a bony matter, and the destruction of the hard parts is, in some degree, repaired; the pus becomes concentrated and dries, the abscess contracts, and its sheath is gradually changed into a kind of canal, which no longer secretes puriform matter, and is at length totally healed, or the abscess may open externally, and terminate like any other abscess in a different part of the body; however, in most cases where the abscess thus opens spontaneously, it becomes fistulous, or the patient dies.

Let us now consider the treatment which should be adopted in the present case. If we look to the general health of our patient, we find it very favourable; his constitution is good, there is little or no pain, and we may say that he is in a promising state, and that the affection under which he labours is as simple as it is capable of being. He has, in fact, no fever of any kind, he does not suffer from diarrhœa or hectic perspirations, and there are no symptoms of constitutional derangement. The pain in the lumbar region has considerably diminished, and the abscess has not yet opened externally. There are, however, on the other hand, some unfavourable conditions in the present case; thus, for example, if the extent of the caries, by destroying several of the bodies of the vertebræ, has the effect of preventing any injurious pressure on the spinal marrow, yet a greater quantity of osseous tissue is necessarily affected, and the labour of regeneration will be more difficult or uncertain; and again, although on examination of the chest we found no signs of the existence of tubercles, yet, from the child's general appearance and temperament, we may fear their formation at a subsequent period. Hence the prognosis in the present case must be guarded, and the chances of a cure are, perhaps, less numerous than those of a fatal termination.

Sometimes the caries of the vertebral column is superficial, and we may attack it with a reasonable hope of attaining a successful result; but not so in the case of our patient. The disease has already existed for too long a time, and the lesion is too profound. What then are we to do? It may be remarked, in the first place, and as a principle of treatment, that the affection is originally an inflammatory one, and hence the antiphlogistic treatment should form the principle we ought to have in view. When I mention antiphlogistic treatment, I do not refer exclusively to blood-letting or debilitating measures; these only form a part of it regarded as a whole. I allude to another and an important branch, viz., the revulsive part, which is included in the term antiphlogistic treatment, and not to the sanguineous, which, in most cases, is not to be thought of.

The first means I would employ is the moxa; this is a most powerful and efficacious external irritant, and we may apply it over various points of the spine, so as to multiply the foci of irritation, according to the method recommended by Baron Larrey; he has often placed thirty or forty moxæ along the spine, and this application has been attended with very remarkable success.

At the same time that we attack the

disease by local measures, we should not neglect general constitutional treatment. Our first and principal object should be to correct the scrofulous temperament, which is strongly marked in the patient; this is to be done by the treatment with which every one is familiar: the child should have good, nourishing, easily-digested food; he should live in a wholesome atmosphere, exposed to a fresh healthy air; he should take gentle and constant exercise, &c., and we may aid these means by the administration of bitters, if indicated.

So much for the general treatment. Now what treatment is applicable to the abscess? Here a variety of opinions exists among surgeons: some open the abscess largely, and expose the cavity as much as possible; but this method is liable to grave objections, and is often followed by very severe and dangerous accidents; however, I find I have not much time to dilate upon these, as the period allotted to this patient is very fast drawing to a close. The second method is that recommended by Baron Boyer, and which consists in opening the abscess by a single incision, directed obliquely, so as to prevent, if possible, the entrance of air into the cavity; but this opening always persists; the atmospheric fluid penetrates into the abscess in spite of every precaution; and besides the inconveniences thus produced, we have added those arising from the retention of altered pus. M. Larrey proposes to traverse the abscess horizontally, from side to side, with a red-hot needle, so as to evacuate the pus, and at the same time enable him to close the wound immediately afterwards.

Finally, M. Dupuytren, fearing the accidents which so frequently result from an artificial opening, has come to the resolution of leaving them to nature. This is a practice which I think we ought not to follow; in permitting the pus to accumulate in too great quantity, we run the risk of having an immense abscess, which must complicate the case in a very unfavourable manner.

As for myself, I would either make several small incisions, or would open the abscess, after the method of Boyer, obliquely, and as the contents became altered in quality, would increase the extent of my incision, and lay it completely open. There are various other points relative to the treatment, which we might consider with advantage. But the time compels me to pass to my other patient.

Second Patient.—Lymphatic Engorgement of the Breast.

Our second patient, Gentlemen, was a female, thirty-seven years of age; she bears marks of a lymphatic temperament of body; several of the cervical ganglia, for example, are tumefied. She has now inhabited Paris for seventeen years, and during that time enjoyed a pretty good state of health.

Some time ago her menses became suspended, and remained so for the space of three months, after which the left mamma began to swell; the menstrual discharge has since then returned with its accustomed regularity, but the breast remains swollen and engorged; it became very large and hard; this produced considerable alarm in the patient's mind, and about six weeks ago she entered the hospital, ready to submit to an operation if necessary. We proceeded immediately to examine the external aspect and relations of the tumour; the first thing with which we were struck, was the regularity of form it presented; the nipple was concealed in the substance of the tumour; the skin covering it was altered in colour, and adherent to the surface of the gland; this latter body was very hard, solid, and resisting to the touch; it did not, however, adhere to the parietes of the chest, for it could be moved about in all directions, and raised up upon the hand. On examining the state of the lymphatic system in the neighbourhood, we found some slight engorgement in the axilla, and the traces of lymphatic tumours under the clavicle; on the right side, the axillary and subclavicular spaces were perfectly free from any swelling, &c. What is the disease with which this woman is affected? (Here the speaker entered into a minute examination of the different tumours which may occupy the breast, comparing them with the case before him, and pointing out the characteristic differences.) The tumours to which the mammary gland is liable are numerous, and very different in kind. The present swelling might, for example, be produced by the presence of an encysted tumour; but the latter usually offers a round or globular tumefaction, and is not marked by the density and hardness which characterize the disease before us. It might be a chronic inflammation of the mammary gland itself, and this is an affection which is very often mistaken for scirrhus. There are numerous examples on record, where the breast has been extirpated for a cancerous affection, which was afterwards discovered to be nothing but a chronic inflammation. With respect to our patient, we may remark that scirrhus is generally developed in a slow and gradual manner, while her disease is comparatively of short duration; the scirrhous tumour is also less smooth and even; it presents a much

greater degree of hardness, and is usually more adherent; the tumour with which this woman is affected is, as I said, round, and we do not feel any inequalities on its surface. The simple adherence of the skin to the subjacent tissues is not sufficient to prove a cancerous nature; besides, the woman is now quite free from pain of any kind. The sunken appearance of the nipple might, at first sight, seem a suspicious circumstance, but we found the same disposition on the other breast. From a review of the symptoms, and a consideration of the history of the case, I would say that our patient has had a chronic inflammation of the cellular tissue of the mammary gland; this has affected chiefly the external cellular tissue surrounding the organ, and it is not improbable that the interstitial tissue is also engaged in the disease.

The state of the lymphatic ganglia may be also taken as an additional proof of the non-scirrhous nature of the disease; they are not, as we before remarked, affected with the degree of hardness peculiar to scirrhus; besides, they do not occupy the situation which the glands enlarged in consequence of a cancerous disease of the breast, usually do. These are commonly found situated in the region of the axilla, while the engorged glands in our patient were placed under the clavicle. I therefore think the disease, in the present instance, is a simple inflammation of the cellular tissue surrounding the breast, and is by no means of a cancerous or malignant nature.

As to the treatment, amputation is evidently an unnecessary operation, and not to be thought of. The diagnosis is, consequently, less grave, and the therapeutic means should consist simply in the employment of antiphlogistic measures. A number of leeches should be placed round the circumference of the tumour. There is a remark, besides, which I had forgotten to make, relative to the diagnosis. The woman says her breast was larger before her entry into the hospital than it is at the present moment, and that its volume was reduced by the use of cataplasms; this is an additional argument of some weight against the idea of a scirrhous engorgement. I would therefore continue the cataplasms, as they have already been useful, with local antiphlogistics, and might perhaps assist their action with the internal administration of mercurials. The resolutive power of iodine is well known to every surgeon; it would therefore be proper to employ frictions of iodine or mercury over the surface of the gland; but the former medicine requires to be employed with care, as it often produces very considerable irritation of the skin. General warm-baths might be advantageously administered, and, finally, compression. (Here the speaker entered into several practical considerations on the importance of compression.) This is a means of the utmost utility in obtaining the resolution of several tumours, and has produced excellent effects even in cases of cancer. Where the case is nothing but a lymphatic engorgement, compression may be used with wonderful success; the manner of employing it is simple, and we cannot follow a better than that proposed by M. Recamier, by whom it was first introduced to the notice of practitioners. It is necessary to remark, that we should be careful in managing the compression and watching its effects, especially in cases of scirrhous engorgement, otherwise we may aggravate the disease, and hasten the cancerous degeneration of the tumour. The utility of this method is, as I have said, decided; I have seen engorgements, having many characteristics of scirrhus, completely dissipated by compression.

Here the president announced to M. Sanson that his hour had terminated.

(To be continued.)

THE LANCET.

London, Saturday, July 5, 1834.

In a recent notice of medical affairs in Dublin, it was stated that an attempt would probably be made by the College of Surgeons of that city to prevent the examination of Mr. Read and Mr. Tagert before the Committee of the House of Commons. It was also stated that those gentlemen were selected for this duty by the heads of the College itself; and that an apprehension that their evidence might not precisely correspond with the objects for which they were appointed, was the cause of their contemplated detention in Dublin. With respect to the wishes of the College on the subject, this was quite correct. The College has, however, adopted a plan for carrying its intentions into effect, somewhat different from that which we anticipated it would

select. After a most deliberate consideration, the reversion of the appointment of Mr. Read and Mr. Tagart was abandoned, as too glaring a violation of decency,—as looking like a distinct confession of guilt. Besides, it was more than possible that the attempt would be defeated by these gentlemen being summoned without the consent of the College. Something, however, was to be done to redeem the Corporation from the evidence of honest men, the testimony of whom (as they could not, by open hostility or by stratagem, be kept at home) it was resolved to overpower, if possible, by the special-pleadings of Messrs. Jacob and Harrison. Summonses were accordingly issued by the College on Friday, and on Saturday, a vote of that body, added Messrs. Jacob and Harrison as a forlorn-hope appendage to the London deputation!

Comment on this act of the College is unnecessary. It will be duly appreciated in the right quarter. There are, however, a few particulars connected with the transaction which it may be well to make public. These advocates of the College are to receive five guineas a day during their absence. The President, too, one of the deputation, has been given the power of putting these gentlemen on pay as soon as he likes, by departing for London whenever he pleases. Five guineas a day is a pretty fair allowance. Yet the College may not have been liberal enough on the occasion; for it may be brought into debt by the supererogatory exertions of its adopted champions, who will not be sinecurists when congenial labour is to be executed. One of our Dublin correspondents expresses his anxiety to know what "earthly object" these gentlemen can have in visiting London;—

"Is it," he inquires, "to explain the charter, or to expound by-laws which he that runs may read?—to adulate a school and a system on the abuses of which they fatten, and which they are in this instance paid to defend? But will they be indulged with an examination? Have they, or will they, be called on to earn the price set on their exertions?—or do they mean to attempt to dictate to the Medical Committee, and force them to accept of their purchased fabrications?"

Something of this spirit would seem to exist amongst them, when one of them intimated in the College on Saturday, that "the Committee-room of the House of Commons was the place to fight the battle of the College!" We rejoice that the advocates of corruption approve of the field which is selected for the fight; but wo be unto them when the result of the battle is proclaimed!

Another of our correspondents thinks that the private lecturers in Dublin are too quiet at the present important crisis;—

He remarks,—"I cannot help contrasting the calculated projects and ardent zeal manifested by the expiring faction in the College of Dublin, with the apathy and absence of all effort on the part of aggrieved practitioners and private teachers of Dublin, to oppose the schemes intended for the perpetuity of their wrongs. Why have there been no resolutions recorded by the former, of the various modes in which they are injured by the medical corporations of Dublin; or, by the latter, of the innumerable ways in which their interests have been sought to be undermined by the Janissaries of Park-Street and the College schools. The College, or rather its school, expends this season perhaps a sum little short of a thousand pounds on agents to advocate its cause in Parliament. The private teachers of Dublin have not as yet subscribed a single shilling, held a single meeting, devised one plan of co-operation, or deputed even one individual to protect their rights, or ward off the blow aimed at their establishments! But there is yet time to redeem themselves from this disgrace, and to avert the consequences which might follow from their neglect. If the College throws away hundreds on the maintenance of its corruptions and its agents, will not the miscellaneous medical practitioners and the private teachers of Dublin, defray the expenses at least of one representative of their cause in London?"

With reference to this question we may observe, that those who undertake the

important duty of defending the general interests of the profession in Ireland, will not fare worse in the cause of truth and rectitude, than will those individuals who render their services on the side of fraud and dishonesty. The medical committee of the House of Commons know full well that the fate of the medical profession in Ireland, as well as the fate of medical science in this country, is in their hands. It is at their control. Most fortunate, therefore, is it, that, judging from what has already been observed of their mode of conducting the inquiry, the most unlimited confidence may be reposed in the integrity of their intentions. Thus, it is felt and acknowledged that they have hitherto discharged their duty fearlessly and effectively. The Chairman and Committee are well aware that they are not to afford a triumph to any party,—to make a declaration in favour of any favourite corporation, but that the great object which their labours were designed to effect, was that of instituting a searching and comprehensive scrutiny into the means of organizing a scheme of reform which will best provide for the interests of the majority of the profession, and at the same time secure the welfare of the community in general.

In discharging such a duty, neither individual feelings, nor partial views, nor the politics of particular parties, will be permitted to interfere. It is not, in short, for the welfare of the medical profession alone that the Committee has been appointed to act, but for the benefit of the entire community, inasmuch as it must necessarily happen, that if the study of the science of medicine be not promoted to such an extent as will produce a sufficient number of competent medical practitioners, the health of society must be placed in danger, and the calls of the sick remain unanswered. The power placed at the disposal of the Committee is commensurate with the importance of the duty which they have been appointed to execute, and the manner in which their power has hitherto been exercised, leaves not the slightest suspicion on the mind that it will, in any one instance, be allowed to remain inactive when it can be employed with advantage, or that it is, or will be, in the slightest degree abused.

PARLIAMENTARY MEDICAL COMMITTEE.

The Committee on Medical Education have been actively engaged in the examination of witnesses since our last report, as the folowing list of names will show. There have been examined,

Messrs. Nussey, Bacot, Watson, Field, and Ridout, and Dr. Burrowes, for the Apothecaries' Company.

Messrs. Phillips, Cooper, Morson, Hanbury, Savory, and Gray, practical chemists.

Several private teachers, amongst them Dr. Epps, Mr. Dermott, Mr. Craven, Mr. Dobson, and Dr. Ryan.

Professor Macartney of Dublin, and Drs. Barlow of Bath, Headlam of Newcastle, and Corden Thompson of Sheffield.

Messrs. Gill of Liverpool, Turner of Manchester, Hey of Leeds, Hodgson and Cox of Birmingham, Oldknow of Nottingham, Sodon of Bath, Clarke and Hetling of Bristol, and Cross of Norwich.

The evidence as regards England being completed, the Committee have, during the last ten days, been engaged in the investigation of the state and system of the Scotch Colleges and Schools, and have examined

Professors Christison, Alison, and Ballingall, of the University of Edinburgh, and

Drs. Abercromby, Poole, Thomson, and Maclagan.

It is not impossible that the inquiry into the medical affairs of Scotland will be brought to a conclusion on the day on which we write this notice, Friday, allowing the remainder of the session to be devoted to those of Ireland.

ARMY MEDICAL BOARD.

(From a Correspondent at Aberdeen.)

In corroboration of some late statements in your widely-circulated Journal, allow me to inform you that the system by which the Army Medical Board has been regulated, as regards the share taken in it by Sir JAMES M'GREGOR, has been distinguished by an undeviating gratification of self-interest, even from a very early period of his military life. I can vouch for the fact that Sir J. M'GREGOR, previous to his having seized the reins of government, and while he was grappling with his iron fist the office of the Director, General M'WEIR, whom he contrived to supplant, causing Sir CHARLES KER also to resign with disgust, he was commencing the system of levying contributions on behalf of the university of this place, whereby to add lustre to his own name. So far back as 1814 he wrote me a letter, which I have carefully preserved as a relic of the great philanthropist, wherein he says—"My Dear ——, I know you to be a very liberal fellow, and though you are about to be reduced upon half pay, and can ill afford subscriptions, yet on this occasion I myself am so deeply interested, that for once you must pull your purse-strings again, and give me something handsome for the Aberdeen library. Mr. ——, who I think you must know, has sent me ten guineas, and you being a North Briton and a generous fellow, cannot do better than follow his good example."

Thus was I compelled, along with many others, to contribute nearly a whole month's pay towards the purchase of books for a library, in which at that period I could have had no more interest than in the Pope's library at Rome. Be it remembered also, that I had contributed but a few weeks before, ten guineas for purchasing the service of plate which has been alluded to in THE LANCET, and for which the medical department of the army owe Dr. GUTHRIE their everlasting gratitude. As may be supposed, I also subscribed one guinea more for the portrait of the gallant Knight, which, though it was announced to be painted for the purpose of adorning the library of this University, has been esteemed too precious by Lady M'GREGOR, to be allowed to escape from her boudoir at Camden Hall. I also subscribed another guinea for the portrait intended for Chatham, as well as for printing the catalogue of the museum, together with another subscription for purchasing books for the library at Chatham, and "yet one more" subscription for plate for Sir W. FRANKLIN. The last subscription which I have been asked to give, is one for Sir WILLIAM'S monument.

We should not, indeed, be at all surprised *here*, if a subscription was shortly to be levied in aid of Dr. GUTHRIE'S blind manufactory, as well as one in prospect for a monument for Sir JAMES himself!

ST. GEORGE'S HOSPITAL.

GENERAL MEETING OF THE GOVERNORS.

THE public are now aware that the medical officers of this hospital are endeavouring to create *two* new appointments in it—an assistant-physician, and a *second* assistant-surgeon. It is understood that both propositions originated in the appointment of an assistant-physician, one of the four physicians, Dr. Chambers, having been long suffering from indisposition, and an assistant thus appearing a necessary appendage. The two new appointments having been proposed, however, at the same time, the whole is considered to be a job of Mr. Brodie, contrived in order to thrust in, as assistant-surgeon to the hospital, a private assistant of his own. It is understood that this association of the two appointments met with considerable opposition from the physicians of the hospital.

On Friday last, a general meeting of the governors took place, to discuss the subject. The meeting was numerously attended.

Dr. SEYMOUR, well trained in all the mysteries of *parish* business, moved on this occasion, that an assistant-physician be appointed to the hospital, and it was gratifying to observe how much the learned Doctor's temper had improved since the meeting of the Weekly Board. In a speech, remarkable only for its length, he endeavoured to prove the propriety of creating such an appointment by stating, that the addition of a number of beds in the hospital, and an increase of out-patients, rendered such an appointment desirable.

Dr. WILSON seconded the motion, and also made a long and temperate address to the governors, severely animadverting on the conduct of Mr. Brodie in proposing the appointment of another assistant-surgeon. He (Dr. Wilson) was of opinion, that not only was such an appointment unnecessary, but he particularly objected to the principle upon which Mr. Brodie

was endeavouring to carry the measure into effect. It was quite evident, in the first place, that Mr. Brodie took the present moment for accomplishing his purpose, because, as it was not probable there would be any objection to the appointment of an assistant-physician, it would be a favourable opportunity for thrusting into the hospital his assistant in private practice, Mr. Cutler. He next commented on Mr. Brodie's having made every arrangement for Mr. Cutler's appointment, in the most secret manner, pointing out, that in order to make it appear that he (Mr. Brodie) had no desire, and was using no means, to secure Mr. Cutler's election, provided the new appointment obtained the acquiescence of the governors, Mr. B. had pursuaded Sir A. Cooper, whose good-nature on all such occasions seemed to have no bounds, to give Mr. Cutler one of his *regular* "certificates," to circulate among the governors before the meeting took place. (*Cheers.*)

Dr. GEORGE GREGORY next rose, and violently opposed the appointment of an assistant-physician, which he considered quite unnecessary. He read over some lists containing statements, showing that the four physicians of St. George's Hospital had less to do than the physicians of other charities, and declared, that should the new creation take place, *he* would not become a candidate, because he considered that it would be beneath the dignity of a man of his character and long standing, to be assistant-physician to a certain party, whom there was no occasion to name more precisely. (*Hear, hear.*)

Dr. RODERICK M'CLEOD, in reply to the observations of Dr. Gregory, said he held in his hand written documents which proved that but a few days ago Dr. Gregory not only highly *approved* of the appointment of an assistant-physician, but absolutely *canvassed for it*, though now on finding that he had no chance of getting the appointment, he came forward to oppose it altogether. (*Great laughter.*)

The debate on this point was here brought to a conclusion, and the motion which occasioned it, the appointment of an assistant-physician, was carried almost unanimously.

Mr. KEATE next proposed that *another assistant-surgeon* be appointed. The chief argument which he employed was drawn from the proposed advantages which the hospital would derive from the superior qualifications which a man would possess for ultimately becoming a *surgeon* to the hospital, in consequence of his having previously served as an assistant.

Mr. BRODIE seconded the motion, and talked much of the *advantages* the hospital would derive from training up assistant-surgeons in the way they should go that when they were hospital surgeons they might not depart therefrom.

Mr. WALKER, the assistant-surgeon of the hospital, next addressed the meeting at considerable length, pointing out—evidently labouring under a good deal of embarrassment—the treacherous conduct which he had experienced throughout the whole affair. However much the hospital, he observed, might be indebted to Mr. Brodie, he could not conceal the deep cunning which had upon this occasion been employed, not for the benefit of the charity, as it might perhaps be pretended, but for the furtherance of selfish interests; and so well did the concoctor of the scheme appear to be aware of the construction that the public would place on the creation of a second assistant-surgeon, that he not only pursued his plans with the most perfect secrecy, keeping them wholly from those who were likely to disturb his plot, but he had not even the manly openness to give his old pupil and assistant in private practice a certificate of his qualifications, such as is usual on these occasions,—nay, even enlisting Sir Astley Cooper against him (Mr. W.) in this unjust cause, Sir Astley being in his (Mr. W.'s) opinion, highly reprehensible for lending his name on this occasion (a common practice of the baronet at all times). It was indeed full time that the "certificate" system should have an end. As for the duties which devolved upon him (Mr. W.) as assistant-surgeon, they were not one-half of those he could perform; wherefore Mr. Brodie's proposition to appoint a second assistant was as wicked as it was useless.

Mr. FULLER made some observations, craving delay and further inquiry, as it was evident that Mr. Brodie had some object in his proposal beyond promoting the advantages of the hospital.

Mr. STONE stepped forward and openly opposed the election of an additional assistant-surgeon, signifying his disapprobation of the clandestine mode in which the whole affair seemed to have been managed.

The Governors present at this meeting here became impatient to put a stop to the debate, and a division accordingly took place on the question, when it appeared that there were

For Mr. Keate's motion	39
Against it	23
Majority	—16

The minutes must be confirmed at the quarterly court of governors in October, but no election can take place until the February following. Mr. Lane and Mr.

Palmer will both canvass for the office, though it is exceedingly doubtful whether the motion will pass at the meeting of governors in October. Mr. Palmer is one of Mr. Brodie's devoted friends who has made a stand on this occasion for the sake of appearances, but it is expected, from the known good blood of Mr. Lane, that he will not *strike*.

SECOND ASSISTANT-SURGEON AT ST. GEORGE'S.

To the Editor of THE LANCET.

SIR,—In the last Number of THE LANCET, in your comments on the new appointment of a second assistant-surgeon to St. George's Hospital, you state that the other two candidates, Mr. Palmer and Mr. Lane, are "shams." In justice to myself I feel it necessary to set you right on this point, and to assert most positively that I am no "sham" in this affair; but, on the contrary, that I am opposed to the principle of the appointment, that I voted against it on Friday the 27th ult., and that I am the only candidate who did so. I beg leave further to state, that I am in earnest in the contest, and am determined to persevere to the last, I trust with fair grounds of success. Under these circumstances, Sir, I am sure you will see the injurious tendency of your remarks, both to my character and interests, at the present moment, and I feel confident you will hasten to do me justice by removing such an erroneous impression at your earliest opportunity. I am, Sir,

Your most obedient humble servant,
SAMUEL LANE.

No. 1, Grosvenor Place,
July 1, 1834.

THE DEGRADING DISPENSARY SYSTEM.

To the Editor of THE LANCET.

SIR,—In your Number of the 7th of June, there is a letter signed "H. B.," with some well-timed remarks on the attempts of certain practitioners who would obtain a little notoriety by the old and stale method of giving away their services; and I think it but right, as one of the profession, to say how heartily I agree with that writer in what he has there stated. I have resided in the same neighbourhood as these dispensary gentlemen for the last seven or eight years, and can vouch for the inutility of anything additional in the dispensary way, there being already something of that sort in almost every street, and with whatever new features this delusive proffer of medical charity may be given to the world the profession well know, and the public also are beginning to understand, the drift of such fallacious contrivances.

London is perhaps the last place in the kingdom where the poor can reasonably complain of any want of medical attention, and I am wholly at a loss to know how the projectors of a scheme such as this can expect to sustain their respectable professional characters, by such a contemptible expedient as this pretended act of charity. Show me a parson or a lawyer who offers his gratuitous services like these men!

You, Mr. Editor, may write about medical reform as long as you please, but I believe (and I know I am not singular in the belief) that the defects in our profession are to be attributed fully as much to the malpractices of some of its members, as to the rules by which we are governed; and while we have to protect ourselves, and the respectability of our profession, from the degradations to which it would be subjected by men who appear to have very limited views in this respect, I fear there is no great chance of amendment.

I regret that the very sensible letter of your correspondent is anonymous, and being convinced that too much cannot be openly advanced in reprobation of the trickery of which it treats, I do not hesitate to subscribe my name and residence. I am, Sir, your obedient servant,

ROBT. HANCORNE.
54, George Street, Euston Square,
June 20th, 1834.

MR. CORBYN'S TREATMENT OF CHOLERA.

To the Editor of THE LANCET.

SIR,—Under a sense of duty to the public, and in justice to the merits of one who is too remote to speak for himself, I take this opportunity of requesting you to insert, in your very useful publication, a few matters of fact relative to that formidable disease with which this country has lately been visited, the cholera.

When I was in India, in 1833, having some cholera patients on board the ship of which I was surgeon, I called on Mr. Corbyn, garrison-surgeon of Fort William, and author of a treatise on cholera, to consult with him regarding the treatment. He recommended me to bleed freely, and to give sedatives, and, after a few hours,

to purge freely. This advice I adopted, and I now feel it my duty to state that the treatment was universally successful, while those who had previously been treated with stimulants, invariably died.

I forward this communication to you in consequence of having seen Dr. James Johnson's critique on Mr. Corbyn's work in the *Medico-Chirurgical Review*, wherein the reviewer has stated that his, Dr. Johnson's, and Mr. Corbyn's treatment are the same. But, so far from this being the case, the fact is that Dr. Johnson prescribes stimulants in conjunction with sedatives, which, I am convinced, has been a very erroneous, though a very common practice in many parts of the world.

In subversion of another statement, equally erroneous, which I have heard made by many since my arrival here, viz. that the epidemic which prevailed in this country required a different mode of treatment from that pursued in India, I will mention the following fact:—On a visit to Ireland, a few months back, when cholera raged there, I was credibly informed that a surgeon in Limerick, who had resided some time in India, had treated the disease, when in that town, on Mr. Corbyn's principles, and with the greatest success. I am, sir, yours, &c.,

R. W. Roberts.

London, June 19th, 1834.

Plates of Arteries.—*To the Editor of* The Lancet.—Sir,—There appears to me to be a strange mystery respecting the Plates of the Surgical Anatomy of the Arteries in which the names of Messrs. Dermott, Bloxam, Millard, Madeley, Fry, Cane, &c. are concerned. As there must be something wrong somewhere towards the profession, I hope for its sake you will give the following statement a place, to put other members on their guard. I am personally unacquainted with any of the above-named persons. A few months ago a person called, a tall young man of good address, at my house, with Part 1 of Plates of the Arteries, said to be by Mr. Dermott. He showed a respectable list of subscribers, and as I thought well of the work I entered my name. Parts 1, 2, 3, 4, and 5, came out rather more rapidly than I expected, all of them in the same cover, with Mr. Dermott's name; the last two had the cover turned, so that it appeared blank on the outside. This, I thought, might be accidental. Part 6 and 7 soon followed with blank covers, and yesterday Part 8 made its appearance. As I had seen a notice on the cover of The Lancet respecting this work, I looked over my Parts, and found on comparing them with The Lancet advertisements I had been deceived. I therefore refused to take Part 8. Mr. Dermott states in his advertisement that his work is published in *numbers*, and that the third is but just published. Mr. Bloxam's plates are published in fasciculi, the *seventh* of which is not to appear until the *first of July*. The plates of my Parts 1, 2, 3, have Mr. Dermott's name lithographed on them. The Parts 4, 5, 6, 7, have their plates marked "Cane, del." and "Madeley, lithog." The person who brought Part 8 informed me that the work was now carried on by Messrs. Bloxam and Millard for Fry. T. Fry, Pentonville, appears to have been the publisher of the first Parts I took in, and on Part 6 is pasted the ticket of T. Fry, Wellington Street, Strand, not agreeing with Messrs. Bloxam and Millard's advertisement, which announces Madeley as their publisher. I am, Sir, yours respectfully,

Lisson Grove, June 14, 1834. J. Houlton.

BIOGRAPHICAL NOTICE.

Died at Edinburgh on the 9th of June last, John Wishart, Esq., F.R.C.S., in the 53rd year of his age. Mr. Wishart was known to the medical world as the translator of the valuable works of Scarpa, particularly of those on aneurysm and hernia, for which laborious employment, along with the addition of many useful notes, he earned the gratitude of all his professional brethren. Besides these publications Mr. Wishart was the author of several original essays which appeared at different times in the *Edinburgh Medical and Surgical Journal*. He was descended from a very old and respectable family in the county of Linlithgow, North Britain, and was educated at the High School of Edinburgh, where he gained the gold medal, a great mark of distinction. He received his medical education at the Edinburgh University, and served an apprenticeship with Mr. Russell, and was for some time one of the clerks of the Royal Infirmary. He completed his education in the most celebrated schools of Germany and Italy, and when at Pavia he formed an intimacy with Scarpa, and at Vienna with Beer. Soon after settling in Edinburgh, Mr. Wishart acquired a lucrative private practice, obtained the character of a judicious and successful practitioner, and continued to enjoy much public confidence. His health, however, gave way, being repeatedly attacked by alarming hæmorrhages from the nose, and he died suddenly of palsy. Mr. Wishart also officinated as one of the surgeons of the Royal Infirmary of Edinburgh, and delivered some clinical lectures in conjunction with Professor Russell. In private life Mr. Wishart was esteemed for an unassuming manner and modesty of deportment, kind and charitable feelings, a strong sense of honour and justice, and much benevolence and affection as a friend, husband, and parent. J. W.

Knife-and-Forkery.—The Worshipful Company of Apothecaries give their annual grand feast on the 17th of July at the *Crown and Anchor*. Some of the most celebrated conservatives and most powerful of the reformers, have received invitations to the table. Sir Henry Halford and Sir Astley Cooper lend their aid on the occasion, as usual.

FINSBURY ELECTION.

To the Members of the Medical Profession, Electors of the Borough of Finsbury.

GENTLEMEN,—The contest for the borough of Finsbury has terminated, and Mr. DUNCOMBE is your representative in the House of Commons.

In making this announcement, permit me to express my gratitude for the support you afforded me throughout the struggle, and to explain to you in a few words the causes which led to my defeat.

The liberal party were split into three divisions, and this became the source of disadvantages which operated to the discomfiture of the medical candidate. The electors in the *reform* interest having on the last occasion been in a minority on the poll with respect to one of the three candidates whom they supported on the present occasion, were induced to hold back until the second day of the election, with a view to come forward and support that liberal candidate who might then occupy the highest position. Thus it happened that Mr. DUNCOMBE and myself on Monday last polled only as many votes as I alone polled on the first day of the election of December twelvemonths; but Mr. DUNCOMBE happening to have a trifling majority over me on the afternoon of Monday, and I, consequently, having released my supporters from their promises (from observing their anxiety at the situation in which they were placed), the electors in the reform interest flocked to the poll on Tuesday, and in less than four hours succeeded in beating down the majority of upwards of three hundred which Mr. POWNALL had acquired on the previous day.

Had I headed Mr. DUNCOMBE on the first day, it is well known that I should have been your representative. I make no complaint, however, but, on the contrary, shall ever remember, with pride and gratitude, the exertions which were so strenuously and unremittingly made by you on my behalf. On a future occasion, when it is next to impossible that circumstances of a similarly untoward character can arise, it is firmly believed that a more gratifying announcement of the termination of the contest will have to be recorded by,

Your ever faithful servant,

THOMAS WAKLEY.

Greenford, Middlesex, July 4th, 1834.

CORRESPONDENTS.

Dr. ALEXANDER (of Manchester) has forwarded to us the following paragraph:—"Dr. Alexander expresses his regret that an individual possessed of the ingenious talent displayed in a late number of THE LANCET, by '*Increpans*,' should so far have forgotten himself as *anonymously* to call in question views authenticated by their author's name. '*Increpans*' must be aware that *such* criticism is necessarily beneath the serious notice of any respectable member of the profession; as he might also have felt assured that nothing could prove more agreeable to their author than a scientific invalidation of the opinions on hydrocephalus lately expressed by Dr. Alexander, provided those opinions had been questioned as openly as they were published."

Again we are obliged, though most unwillingly, to postpone the insertion of the communication forwarded by *Mr. James*. Next week room shall be found for it, and also for the letters of *M. B. O.*, *Delta*, and many other correspondents, whose letters we have not space to acknowledge.

BOOKS RECEIVED.

(From the author.) Pathological Anatomy. Illustrations of the Elementary Forms of Disease. By Robert Carswell, M.D., London University. Fasciculus 6th. Softening, 1834. Coloured plates.

A Practical Treatise on the Diseases of the Uterus and its Appendages; translated from the French of Veuve Boivin and A. Duges. With copious notes, by G. O. Heming, F.L.S., &c. 1834. 8vo, pp. 539, with plates.

The Transactions of the Provincial Medical and Surgical Association. Vol. 2. 1834. 8vo, pp. 546. Plates.

The Signs, Disorders, and Management of Pregnancy: the treatment to be adopted during and after confinement; and the management and disorders of Children. Written expressly for the use of Females. By Douglas Fox, M.R.C.S. &c., Derby 1834. 8vo, pp. 206.

A Series of Anatomical Plates in Lithography, with references and physiological comments, illustrating the structure of the different parts of the human body. Edited by Jones Quain, M.D., London University. To Part 14, published June 14th. Folio.

The Anatomy and Operative Surgery of Inguinal and Femoral Hernia. By Valentine Flood, A.M., M.D., Richmond Hospital School of Medicine. Illustrated by eight folio plates from nature. Royal 4to. 1834. pp. 15.